University of California
Cooperative Extension
Master
Food
Preserver

Oktoberfest Workshop

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Presented by the UCCE Master Food Preservers of Amador/Calaveras Counties

UC Master Food Preserver Program Mission:
To teach research-based practices of safe home food preservation to the residents of California.

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Contents

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Boiling Water & Steam Canning Basics

Basic Food Safety

Wash Hands Frequently

- Personal cleanliness is a must. Wash your hands thoroughly and frequently. *E. coli* resides in the human nose and intestines. Wash your hands if you rub your nose, or if you wipe your face or skin.
- Bandage any cuts or burns on hands before handling food, or use disposable gloves.

Avoid Cross Contamination

- Rinse all fresh fruits and vegetables well under running water before preparing or eating them. Dry them with a clean cloth or paper towel.
- **ALWAYS** wash your hands, knives, cutting boards, and food preparation surfaces well with soapy water before and after any contact with raw meat, fish, or poultry.
- Use a disinfecting solution of 1½ teaspoon of chlorine bleach to 1 pint of water. Dispense with a spray bottle to disinfect countertops, cutting surfaces, sinks, etc. Let sit one minute then wipe. Make a new solution daily.

When In Doubt, Throw It Out

- Never taste food that looks or smells strange to see if it can still be used.
- Most bacteria that cause foodborne illness are odorless, colorless, and tasteless.

Canning Basics

Get Ready … Be Prepared!

- Read the recipe thoroughly before you begin.
- Measure out all ingredients.
- Have all of your utensils at hand.
- Wash jars, lids and rings in hot soapy water and rinse well. Check jars for imperfections.
- Place clean jars into the boiling water canner and heat the jars.
- Prepare lids and rings according to the directions on the lid and ring packages. (Newer boxes of lids don't require pre-heating, older ones do. You may still pre-heat newer lids.)
- Do a "dry run" of the recipe to make sure you have all of your materials.

General Canning Supplies

- Standard canning jars, rings, self-sealing one-time use lids ; no paraffin wax as a sealing agent
- Funnel
- Headspace measurer
- De-bubbler
- Jar lifter
- Tray/towel for hot jars
- Lid lifter
- Reputable recipe that follows the USDA recommended canning procedures

Canning Processes

- Use an **atmospheric steam canner** or a **boiling water canner** for high acid foods: fruits, pickled and fermented products, jams and jellies.
- Use a **pressure canner** for low acid foods: meats, vegetables, and mixtures of high and low acid foods

Why two different processes? Low acid foods must be pressure canned because *Clostridium botulinum*, the bacteria that causes botulism, is a spore former. When conditions are not favorable for the organism to grow (high heat, dryness, etc.), the bacterial cell forms a protective structure called a spore. It takes a higher temperature than boiling to destroy the spores: 240º - 250ºF. If you do not destroy the spores in low acid foods they will germinate and produce fatal toxins in the food when it is stored on the shelf. High acid foods have enough acidity to destroy spores.

The USDA does not recommend the open kettle method of canning because it does not prevent all risks of spoilage.

Raw-Pack vs. Hot-Pack Methods

Filling jars with raw, unheated food prior to heat processing is called the raw-pack method. The preferred method, filling jars with preheated, hot food prior to heat processing, is called the hot-pack method. Benefits include a tighter pack and, because food expels air when heated, less float.

Jars

Check jars, lids and bands for high quality. Wash jars, lids and bands in hot, soapy water. Rinse well. Dry bands. Heat home canning jars in hot water, not boiling, until ready for use. Fill a large saucepan or stockpot half-way with water. You may also place them in your canner. Place jars in water (filling jars with water from the saucepan will prevent flotation). Bring to a simmer over medium heat. Keep jars hot until ready for use. You may also use a dishwasher to wash and heat jars. Keeping jars hot prevents them from breaking when hot food is added. Leave lids and bands at room temperature for easy handling.

Headspace

Headspace is the completely empty space left in the jar underneath the lid and above the food. Headspace allows for food to expand during canning without being forced out from under the lid during processing. Recommended amounts also allow for good vacuums to be formed for holding lids in place and good food quality to be maintained during storage.

Atmospheric Steam Canning Essentials

Atmospheric Steam Canning Equipment

- Shallow base pan to hold water with a fitted rack that sits on the base, with a high domed cover. The cover has one or more vent holes near the bottom.
- Some models have a temperature sensor that indicates when the steam is at the correct temperature to start timing the process.

Adjusting for Altitude

All recipes are developed using sea level as the criteria for processing times. At sea level, water boils at 212°F. At higher altitudes water boils at a lower temperature. Adjustments have to be made to ensure safe canning. Canning at any altitude higher than 1,000 ft. requires adjusting the processing time, refer to the Altitude Chart for these times.

Using an Atmospheric Steam Canner

- Use a research tested recipe and processing time developed for a **boiling water** canner when using an atmospheric steam canner. An atmospheric steam canner may be used with recipes approved for half-pint, pint, or quart jars.
- Add enough water to the base of the canner to cover the rack. (Follow manufacturer recommendations.)
- 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. Do not have the water boiling when you add the jars.
- Heat jars prior to filling with hot liquid (raw or hot pack). Do not allow the jars to cool before filling.
- Load filled jars, fitted with lids, onto the canner rack and place the lid on the canner base.
- Turn heat to its highest position to boil the water until a steady column of steam (6-8 inches) appears from the vent hole(s) in the canner lid. Jars must be processed in pure steam environment.
- If using a canner with a temperature sensor, begin processing time when the temperature marker is in the green zone for your altitude. If using a canner without a temperature sensor, begin processing time when a steady stream of steam is visible from the vent hole(s).
- Set the timer for the total minutes required for processing the food, adjusting for altitude. Processing time must be limited to **45 minutes or less, including any modification for elevation**. The processing time is limited by the amount of water in the canner base. When processing food, **do not** open the canner to add water.
- Monitor the temperature sensor and/or steady stream of steam throughout the entire timed process. Regulate heat so that the canner maintains a temperature of 212°F. A canner that is boiling too vigorously can boil dry within 20 minutes. If a canner boils dry, the food is considered under-processed and therefore potentially unsafe.
- At the end of the processing time, turn off the heat and remove the lid, lifting the lid away from you.
- Using a jar lifter, remove the jars without tipping 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.

Altitude Chart

Altitude in feet	Increase processing time
1000 - 3000	5 minutes
3001 - 6000	10 minutes
6001 - 8000	15 minutes

Boiling Water Canning Essentials

Boiling Water Canning Equipment

- Deep, non-reactive kettle, stainless steel or enamel with a bottom rack.

Adjusting for Altitude

All recipes are developed using sea level as the criteria for processing times. At sea level, water boils at 212°F. At higher altitudes water boils at a lower temperature. Adjustments have to be made to ensure safe canning. Canning at any altitude higher than 1,000 ft. requires adjusting the processing time, refer to the Altitude Chart for these times.

Using a Boiling Water Canner

- 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.
- 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. Do not have the water boiling when you add the jars.
- Load filled jars, fitted with lids, 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.
- Add boiling water, if needed, so the water level is at least 1 inch above jar tops. Pour the water around the jars, not on them. For process times over 30 minutes, the water level should be at least 2 inches above the tops of the jars.
- Turn heat to its highest position, cover the canner with its lid, and heat until the water in the canner boils vigorously.
- Set the timer for the total minutes required for processing the food, adjusting for altitude.
- 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.
- Add more boiling water, if needed, to keep the water level above the jars.
- When the jars have boiled for the recommended time, turn off the heat and remove the canner lid. Wait no more than 5 minutes before removing jars.
- Using a jar lifter, remove the jars without tipping 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.

Altitude Chart

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Finishing

Removing and Cooling Jars

Be careful when moving and lifting filled jars. Do not tilt. Do not be tempted to try to pour off the water on the top when lifting them out of the canner. The water on top of the hot jars will evaporate very rapidly. If the jars are tilted, food may become lodged between the glass rim and the sealing compound preventing proper sealing. Do not leave the jars in the hot water until cooled as the jars will fail to seal, which will result in spoilage.

The Next Day …

- After cooling the jars for 12 to 24 hours, remove the screw bands.
- Check each jar for a seal; press the middle of the lid with your finger. If the lid springs up when you release your finger, the lid is unsealed.
- Clean the jars with a damp cloth. Thoroughly dry ring bands may be replaced on the jars, if desired.
- Label the jars with the product name, date, processing method (WB = Boiling Water/Water Bath, PC = pressure canner), and store in a cool, dark, dry area.
- If a jar did not seal, check the jar for flaws. Refrigerate and use the product within a few days, freeze the jar, or reprocess it within 24 hours using a new lid and if necessary, a new jar. Process by the method originally advised for the full length of time.

Resources

Research-Based Sources for Canning and Other Food Preservation:

- National Center for Home Food Preservation (http://nchfp.uga.edu/)
- USDA Guide to Home Canning, 2015
- So Easy to Preserve 6th Edition, September 2014 (University of Georgia)
- The Ball Blue Book Guide to Preserving, 2014
- Ball Complete Book of Home Preserving, 2012
- University of California Publications
- Cooperative Extension Offices (all 50 states)
- Package inserts included with name-brand pectins
- For more links: http://mfp.ucanr.edu

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Mustard Recipes

Oktoberfest Beer Mustard

Yield: five 4-ounce jars

1-1/2 cups beer
1 cup brown mustard seeds
1 cup water
1/2 cup malt vinegar
1/2 cup lightly packed brown sugar
1/4 cup dry mustard
1 Tablespoon onion powder

1. Combine beer and brown mustard seeds in a medium saucepan. Bring to a boil. Remove from heat, cover and let stand at room temperature until seeds have absorbed most of the moisture, about 2 hours.
2. Prepare canner. Heat jars until ready for use. Do not boil water. Wash lids in warm soapy water and set bands aside.
3. Place mustard seeds and remaining liquid in a food processor or blender. Process until chopped and slightly grainy.
4. Transfer mixture to a large saucepan. Whisk in water, vinegar, brown sugar, dry mustard and onion powder. Bring to a boil. Reduce heat and simmer, stirring frequently, until volume is reduced by a third, about 15 minutes.
5. Ladle hot mustard into hot jars leaving 1/4-inch headspace. Remove air bubbles. Wipe rims. Apply lids and rings.
6. Process in boiling water or atmospheric steam canner for 10 minutes at 0-1,000', 15 minutes at 1,001-3,000', 20 minutes at 3,001-6,000', 25 minutes at 6,001-8,000', and 30 minutes at 8,001'-10,000'.

Source: Ball Complete Book of Home Preserving, 2012

Lemon-Sage Wine Mustard *Yield: five 4-ounce jars*

1 bunch of fresh sage
3/4 cup dry white wine
3/4 cup yellow mustard seeds
1 cup white wine vinegar
Grated zest and juice of 2 large lemons
1/2 cup liquid honey
1/4 teaspoon salt

1. Finely chop enough sage leaves to measure 1/3 cup and set aside. Coarsely chop remaining sage leaves and stems to measure 1/2 cup and place in a small non-reactive saucepan with white wine.
2. Bring to a boil over medium heat, stirring and pressing sage to release flavor.
3. Remove from heat. Cover tightly and let steep for 5 minutes.
4. Transfer sage infusion to a sieve placed over a non-reactive bowl and press leaves with the back of a spoon to extract all the liquid.
5. Discard solids and return liquid to saucepan. Add mustard seeds. Cover and let stand at room temperature until seeds have absorbed most of the moisture, about 2 hours.
6. In a blender or food processor, combine marinated mustard seeds (with liquid) and vinegar. Process until blended and most of the seeds are well chopped. (You want to retain a slightly grainy texture.)
7. Transfer mixture to a non-reactive saucepan; add lemon zest, juice, honey, salt, and reserved finely chopped sage leaves.
8. Bring to a boil over high heat, stirring constantly. Reduce heat to low and boil gently, stirring frequently, until volume is reduced by a third, about 20 minutes.
9. Ladle hot mustard into hot jars, leaving 1/4-inch headspace. Remove air bubbles; adjust headspace if necessary. Wipe rims. Apply lids and rings.
10. Process in boiling water or atmospheric steam canner for 10 minutes at 0-1,000', 15 minutes at 1,001-3,000', 20 minutes at 3,001-6,000', 25 minutes at 6,001-8,000', and 30 minutes at 8,001'-10,000'.

Source: Ball Complete Book of Home Preserving, 2012

Cranberry Mustard *Yield: five 4-ounce jars*

1 cup red wine vinegar
2/3 cup yellow mustard seeds
1 cup water
1 Tablespoon Worcestershire sauce
2-3/4 cups cranberries (fresh or frozen)
3/4 cup sugar
1/4 cup dry mustard
2-1/2 teaspoons ground allspice

1. In a medium stainless steel saucepan, bring vinegar to a boil over high heat. Remove from heat and add mustard seeds. Cover and let stand at room temperature until seeds have absorbed most of the moisture, about 1 1/2 hours.
2. In a blender or food processor fitted with a metal blade, combine marinated mustard seeds with liquid, water and Worcestershire sauce. Process until blended and most seeds are well chopped. You want to retain a slightly grainy texture. Add cranberries and blend until chopped.
3. Transfer mixture to a saucepan and bring to a boil over medium heat, stirring constantly. Reduce heat to medium-low and boil gently stirring frequently, for 5 minutes. Whisk in sugar, dry mustard and allspice. Continue to boil gently over low heat, until volume is reduced by a third, about 15 minutes.
4. Ladle mustard into hot jars leaving 1/4-inch headspace. Remove air bubble. Wipe rims. Apply lids and rings.
5. Process in boiling water or atmospheric steam canner for 10 minutes at 0-1,000', 15 minutes at 1,001-3,000', 20 minutes at 3,001-6,000', 25 minutes at 6,001-8,000', and 30 minutes at 8,001'-10,000'.

Source: Ball Complete Book of Home Preserving, 2012

Resources

National Center for Home Food Preservation. http://nchfp.uga.edu/
Complete Guide to Home Canning. 2009. USDA Agricultural Information Bulletin 539. National Institute of Food and Agriculture. Available from: http://nchfp.uga.edu//publications/publications_usda.html

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Basic Sausage-Making at Home
Fresh (Raw) and Cooked Sausage Recipes

Sausage made from the recipes included in this handout may be refrigerated or frozen in bulk or linked using natural casings. See companion handout, "UCCE Master Food Preservers of Amador/Calaveras County Basic Sausage-Making at Home, Fresh (Raw) and Cooked Sausage," for additional directions on preparing meat, grinding, stuffing casings, storing and cooking sausage.

Breakfast Sausage — Yield: 2 pounds

2 pounds boneless pork shoulder, cut into 1 inch cubes
2 teaspoons salt
1-1/2 teaspoons ground black pepper
2-4 teaspoons dry, rubbed sage (to taste)
2 teaspoons dry thyme leaves
1 tablespoon brown sugar
1/2 teaspoon fresh ground nutmeg
1/2 teaspoon red pepper flakes
1/2 teaspoon cayenne pepper

1. Combine pork chunks with all other ingredients and chill in freezer for about 1 hour.
2. Using the fine blade, grind the seasoned pork.
3. Store in bulk. Refrigerate for 2-3 days or freeze for up to 3 months.

Source: Adapted from Alton Brown recipe

Spicy Italian Sausage — Yield: 4 pounds

1 4-pound skinless, boneless pork shoulder (Boston butt), cut into 1-2 inch pieces
30 grams kosher salt or 3 tablespoons kosher salt
1 tablespoon fennel seeds, toasted
1 freshly ground black pepper
2 teaspoons cayenne pepper
2 teaspoons paprika
1 teaspoon smoked paprika
1 teaspoon crushed red pepper flakes
1 teaspoon powdered garlic
3 tablespoons dry red wine
Casings, cleaned and rinsed (Optional)

1. Chill all grinder parts. Place pork in a single layer on baking sheet; cover and freeze until meat is very firm but not frozen, about 30 minutes to 1 hour.
2. Combine salt and spices in a small bowl; set aside.
3. Grind pork on high speed, 3-4 pieces at a time, into chilled bowl.
4. Sprinkle spice mixture evenly over pork and knead until evenly distributed, about 1 minute.
5. Add wine; knead mixture until holds together and is very stiff.
6. Cook small patty in a skillet over medium-low heat until meat is cooked through, about 4 minutes per side. Let rest 2 minutes. Taste test; adjust spices as necessary.

Source: Adapted from Bon Appetit recipe

Polish Sausage — Yield: 1-1/2 pounds

1-1/2 pounds coarsely ground pork
1/2 teaspoon ground allspice
3-1/2 teaspoon pepper
6 cloves garlic, crushed
1 teaspoon salt
1to 2 teaspoon liquid smoke, to taste
1/2 cup ice water
2 tablespoons red wine
Casings, cleaned and rinsed (Optional)

1. In a large chilled bowl, mix all ingredients except the water, then add the water and mix
2. Roll into a sausage shape. Place shaped sausage in plastic bags that can be sealed and are safe to cook in.
3. Place bag into boiling water. Boil for 45 minutes.
4. Remove sausages from bag and store in the refrigerator or freezer for later use.
5. Reheat by browning in a frying pan or grill, bake or broil to an internal temperature of 160°F.

Mexican Chorizo Sausage — Yield: 1-1/2 pounds

1-1/2 pounds pork shoulder, cut into 1-inch cubes
2-1/2 teaspoons kosher salt
1 tablespoon ancho chili powder
1/4 teaspoon ground achiote (optional)
3 medium cloves garlic, minced (about 1 tablespoon)
2 teaspoon dried Mexican oregano
1 teaspoon ground onion powder
1 teaspoon smoked Spanish paprika
1 teaspoon ground cumin
1/2 teaspoon freshly ground black pepper
1/4 teaspoon ground cloves
1/4 teaspoon ground coriander seed
Pinch ground cinnamon
3 tablespoons red wine or apple cider vinegar

1. Combine all ingredients in a large bowl and toss until homogenous. Let rest for at least 4 hours and up to overnight. When ready to grind, grind through a chilled meat grinder fitted with a 1/4-inch plate. Alternatively, working in 1/4-pound batches, pulse in a food processor until finely chopped.
2. Knead chopped meat by hand in a large bowl, or with the paddle attachment in the stand mixer until slightly tacky. Cook as desired or refrigerate/freeze for later use.

Source: Adapted from J. Kenji Lopez-Alt of Serious Eats

All-Beef Summer Sausage — Yield: 3 pounds

3 pounds ground chuck with 25 percent fat
4 cloves garlic, minced
1 tablespoon kosher or coarse salt
2 teaspoons brown sugar
1 teaspoon whole mustard seed
1 teaspoon freshly ground black pepper (medium grind)
Curing salt (use supplier's recommended quantity for 3 pounds of meat)
1 cup water
3/4 teaspoon liquid smoke, to taste
3 feet large beef casings, cleaned and rinsed

1. In a large bowl, combine the ground meat and the garlic. Mix well, using your hands.
2. In a smaller bowl, combine the salt, sugar, mustard seed, pepper, curing salt, water, and liquid smoke. Stir until blended. Add the water mixture to the meat mixture. Mix well, using your hands.
3. Stuff the mixture into the prepared casing, prick air pockets, and twist off into 6-inch lengths. Cut the links apart with a sharp knife. Place the links on a platter, cover, and refrigerate overnight to meld the flavors.
4. Preheat the oven to 200°F.
5. Arrange the links on a broiler pan and bake for 4 hours, or until the internal temperature reaches 160°F on an instant-read thermometer. The meat will remain bright red even when fully cooked. (Alternatively, the links can be smoked in a smoker following manufacturer's instructions.)
6. Cool the sausages. Eat immediately or refrigerate for up to 3 weeks.

Source: Home Sausage Making, Susan Mahnke Peery & Charles G. Reavis

Swedish Potato Sausage — Yield: 5 pounds

1 pound very lean beef
1/2 lean pork butt
1/2 pork fat
5 large potatoes
1 large onion, peeled and coarsely chopped
2 teaspoons kosher or coarse salt
1/2 teaspoon freshly ground black pepper (medium grind)
1/2 teaspoon freshly ground white pepper (medium grind)
1/4 teaspoon ground allspice
1/4 teaspoon ground mace
1/4 teaspoon freshly grated nutmeg
1 clove garlic, minced
Chicken broth for cooking sausage
4 feet medium hog casings, cleaned and rinsed

1. Cut the beef, pork, and pork fat into 1-inch cubes. Freeze the cubes for about 30 minutes to firm them up before grinding through the fine disk of a meat grinder. Refrigerate until ready to use.
2. Peel and boil the potatoes in lightly salted water for 10 minutes. They will be quite firm in the center. Allow them to cool before processing.
3. Cube the cooled potatoes and mix with the onion. Put the mixture through the fine disk of the grinder.
4. In a large bowl, combine the ground meats and potato mixture. Add the salt and spices. The mixture will be sticky, so dip your hands in cold water, then mix well, using your hands.
5. Stuff the mixture into the prepared casing, prick air pockets, and twist off into 12-inch links. With butcher's twine, tie two separate knots between each link and one knot at each end. Separate the links by cutting between the two knots, then bring the ends of each link together and tie to form a ring.
6. Poach the rings in chicken broth to cover for 45 minutes. Serve warm or refrigerate and serve cool. The sausages may be refrigerated for up to 3 days or frozen for up to 3 months.

Source: Home Sausage Making, Susan Mahnke Peery & Charles G. Reavis

Chicken or Turkey Sausage — Yield: 5 pounds

5 pounds of boneless, chicken or turkey (combination of light and dark meat), skin included
1 cup finely chopped fresh onion or 2 tablespoons onion powder
3/4 cup chopped dried apples
1/2 cup dried apricots
1 tablespoon dried sage
1 tablespoon kosher salt
2 teaspoons ground black pepper
1 teaspoon ground nutmeg
1 teaspoon dried red pepper flakes
1 cup dry nonfat milk powder
Casings, cleaned and rinsed (Optional)

1. Cut the meat and skin into workable pieces, chill 1 hour in freezer, and grind through the medium plate on your meat grinder.
2. Add the spices and milk powder to the ground meat and mix well by hand.
3. Grind the sausage mixture one more time through the medium plate on your meat grinder.
4. Stuff immediately into natural or collagen casings or refrigerate/freeze in bulk for later use.

Chicken Spinach Feta Cheese Sausage — Yield: 4 pounds

3-1/2 pounds of boneless, skinless chicken (combination of light and dark meat), ground
1/2 bunch of fresh spinach, cleaned and stems removed, finely chopped
5 ounces crumbled feta cheese
1 tablespoons kosher salt
1-1/2 tablespoons white pepper
1-1/2 tablespoons dried marjoram
1 tablespoon dried onion flakes
1 tablespoon garlic granules
1 tablespoon dried basil
Casings, cleaned and rinsed

1. Put your ground meat in a large bowl and stir in the seasonings with a strong spoon or using clean hands knead mixture.
2. Link or leave bulk.
3. Cook and use as desired or refrigerate/freeze for later use.

Sources

National Center for Home Food Preservation: http://nchfp.uga.edu/
Cooperative Extension Offices (all 50 states)
University of Wisconsin Extension Meat Science, “Manufacturing guide to Producing Processed Meat Products”
University of Georgia, Basics of Sausage Making, UGA Extension Bulletin 1437, December 2014

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Making Sauerkraut

Intro to Sauerkraut

Sauerkraut is a naturally fermented cabbage. Natural fermentation is one of the oldest means of food preservation. The juice extracted from shredded cabbage by adding salt contains fermentable sugars. Cabbage's natural flora cause fermentation to take place. In the absence of air, the microorganisms on cabbage leaves will produce between 1.5 and 2 percent acid (chiefly lactic acid) and thereby preserve the cabbage.

Sauerkraut is a low-calorie food – only 42 calories per cup – and a good source of vitamin C (30 mg per cup). However, because of the salt necessary to regulate the fermentation, sauerkraut is a high-sodium food, containing about 1.5 grams (1,500 mg) sodium per cup. For that reason, people trying to moderate sodium intake should take into account the sodium content of sauerkraut before including kraut in their menu. *Note:* You can reduce the sodium content – as well as the tartness – by rinsing sauerkraut in cold water before using. Do not reduce the amount of salt used in the fermentation process.

Ingredients

Cabbage. The amount of natural sugars of cabbage differs with the variety and conditions of its growth. Fully mature, large-headed types weighing 6 to 15 pounds per head with a solid, white interior are the most desirable for kraut. The larger the head, the sweeter it is. This is particularly true later in the fall after a few light frosts. However, smaller heads can be used.

Salt. Use a non-iodized salt, because iodine will prevent the bacterial fermentation necessary to change cabbage into sauerkraut. Use bulk pickling or canning salt, available at most supermarkets, in making sauerkraut. Add 2.25 to 2.5 percent salt by weight (Procedure 3 below for exact recipe). Salt draws out the cabbage juice so it can be fermented. Salt also helps control the flora of the fermentation by favoring the lactic acid-producing bacteria and inhibiting the undesirable competitors. In this way, salt acts as a preservative. Using too little salt not only softens the cabbage tissue, but also yields a product lacking in flavor. Too much salt delays the natural fermentation and, depending on the degree of over salting, may cause an acrid flavor, darken the color or allow pink pigment-producing yeasts to grow.

Equipment

Shredder. Shred cabbage using a large, sharp knife, mandolin cutter or food processor.

Container. A 5-gallon container will hold about 25 pounds of prepared cabbage. An old-fashioned earthenware crock ranging in size from 2 to 20 gallons is the traditional container. Food-grade plastic pails that are sturdy and rigid make excellent containers. Glass containers can also be used successfully. **Note:** Used crocks bought at auctions or found among family treasures should be carefully checked for cracks or chips. If a crock has a poor glaze or is chipped, don't use it for making sauerkraut. Do not use

metal containers of any type. The dyes used in nonfood plastic containers and bags are not intended for food use, and may not be safe when in contact with a food product. If you must use a nonfood-grade plastic container line it with a clean, heavy food-grade plastic bag.

Procedure

1. Remove defective and coarse outer leaves from the cabbage. This will also get rid of any residual insecticide spray or dust. Cut away any spoiled or damaged spots. Rinse heads lightly in cold water to remove dust or visible dirt particles; drain. The bacteria needed to ferment the cabbage are found on the cabbage leaves.
2. Cut heads into halves or quarters and core. Slice or shred the cabbage so that the shred is as long and thin as possible. If you use a food processor, you may not get this characteristically desirable shred, but it will not affect the fermentation.
3. Weigh the cabbage. Place the first 5 pounds in a sterilized pan or bowl. For every 5 pounds of cabbage, sprinkle with 3 tablespoons pure canning or pickling salt (not iodized). Mix well to distribute the salt uniformly. Allow the salted cabbage to stand 5 to 10 minutes to wilt slightly and begin to draw out juices. Then pack the cabbage into a crock or other suitable container. Pound the cabbage firmly with a wooden tamper until enough juices are drawn out to cover the cabbage. Repeat this procedure layer by layer, until the container is filled to the desired depth and the cabbage is completely covered with 1 to 2 inches of juice. Leave at least 4 or 5 inches between the cabbage and the top of the container.
4. A brine-filled plastic bag is one of the easiest and best ways to both cover and weight down the cabbage. Be sure you use a clear, heavy-duty, watertight plastic bag intended for food use. Clear freezer bags sold for packaging turkeys are suitable for use on 5-gallon containers. Fill the bag with salted water (6 tablespoons salt in 1 gallon water) to a depth of 3 to 4 inches, allowing the bag to completely cover the cabbage. As an alternative method, cover the cabbage with a clean cloth or clear plastic, fitting the covering snugly against the container sides. Then place a wooden, china or other nonmetal disc and a weight on top.
   Note: It is absolutely essential that you cover the cabbage and liquid to exclude air, since the fermentation process requires anaerobic conditions (without oxygen).
5. Place the container of cabbage in a well-ventilated place with a relatively constant temperature. If kept at room temperature (70° to 75°F), the kraut should be ready in 3 to 4 weeks. At higher temperatures, fermentation will proceed more rapidly and the kraut will be ready sooner. Conversely, if kept at temperatures lower than 70°F, fermentation will be slow, but may be incomplete if the temperature drops below 60°F. It is desirable to provide 70° to 75°F temperatures during the first several days to begin production of the acid that will preserve the cabbage. Then, if you want a slower fermentation, the container could be stored in a cooler area such as a basement or unheated garage. If the temperature drops below freezing, fermentation will stop, but will start again when the temperature rises into a favorable range.
6. Check the container daily. During the fermentation, film yeasts or molds may form on the liquid's surface. If they appear, skim them off. If any discoloration appears within the top inch of kraut, remove it. If you are using a cloth covering, rinse or replace it each time you remove scum or spoiled cabbage.
   Note: Scum is less likely to form when you use the water-filled bag as a cover and weight.

Long-Term Storage

While there are four alternatives for storing sauerkraut after fermentation is complete, canning and freezing are preferable for maintaining high quality during long-term storage.

Canning

- **Hot pack** – Bring kraut and liquid slowly to a boil in a large kettle, stirring frequently. Remove from heat and fill jars rather firmly with kraut and juices, leaving 1/2-inch headspace.
  Raw pack – Fill jars firmly with kraut and cover with juices, leaving 1/2-inch headspace.
- If there is not enough sauerkraut juice to cover all the kraut in the jars, use a boiling hot, weak brine – 2 tablespoons salt for each quart of water.
- Adjust lids and process in a boiling-water canner according to the recommendations below.

		Process Time at Altitudes of			
Style of Pack	**Jar Size**	**0 - 1,000 ft**	**1,001 - 3,000 ft**	**3,001 - 6,000 ft**	**Above 6,000 ft**
Hot	Pints	10 min	15 min	15 min	20 min
	Quarts	15 min	20 min	20 min	25 min
Raw	Pints	20 min	25 min	30min	35 min
	Quarts	25 min	30 min	35min	40 min

Freezing

Pack sauerkraut and juice in rigid plastic moisture- or vapor-proof freezer containers, in glass freezer jars (leaving 1-½ inches headspace), or in heavy, tightly sealed plastic freezer bags. Freeze.

Refrigerating – for shorter-term storage

The kraut may also be placed in tightly closed jars or sealed freezer bags and stored in the refrigerator for as long as several months.

Leaving in the Crock – for shorter-term storage

If you have a cool basement, garage or other storage area, the sauerkraut may be kept in the crock indefinitely as long as the surface is not exposed to air, which may cause spoilage. No refrigeration is required. But after removing portions, cover and weight down. A small amount of spoilage may appear after each opening, but you can remove it the next time you open the crock.

Making Small Amounts

This method is convenient if you make into sauerkraut only a head or two of cabbage at a time. But making small amounts may result in more spoilage losses. Use any type of 2-quart standard canning jar that is free from nicks, chips or cracks. Wash the fermentation container and weights in hot sudsy water, and rinse well with very hot water before use.

Select and prepare the cabbage as directed in the instructions for making a larger batch of sauerkraut. A 2-quart jar will hold about 3-1/3 pounds of shredded cabbage. To this amount, add 2 tablespoons plus 1 teaspoon canning or pickling salt (not iodized). Thoroughly mix salt into cabbage. Allow the salted cabbage to stand for 5 to 10 minutes to wilt somewhat and begin to draw out juices.

Pack the cabbage firmly into the jar, filling it to the top. Press down firmly until juice runs out of the cabbage and covers it completely. Put the sterilized lid on the jar just tightly enough to keep out air. Set the jar on a tray or in a pan to collect juice that may leak out during active fermentation. Keep the jar at room temperature (70° to 75°F) until the bubbling stops. This will usually take 2 to 3 weeks. ***Note:*** Do not pour the juice that bubbles out back into the jar.

When the bubbling stops, check to be sure that there is still enough liquid to cover the kraut. If there is not, replace the juice that has bubbled out with a boiling hot, weak brine – 2 tablespoons salt per quart of water. Retighten the cover securely, wipe the outside of the jar and store in the refrigerator or a very cool place until you use it up. For longer storage, use the canning or freezing methods described earlier.

Spoilage Problems

Spoilage in sauerkraut causes undesirable color, off-odors, soft texture and unpleasant flavor.
Softness may result from insufficient salt, high temperatures during fermentation, uneven salt distribution or air pockets caused by improper packing.
Pink color in kraut is caused by the growth of certain types of yeasts on the kraut surface. These may grow if there is too much salt or unevenly distributed salt, or if the kraut is insufficiently covered during fermentation.
Rotted kraut is usually found at the surface, where the cabbage has not been covered sufficiently to exclude air during fermentation.
Darkness in kraut may be caused by unwashed and improperly trimmed cabbage, insufficient juice to cover the cabbage during fermentation, uneven salt distribution, exposure to air, high temperatures during fermentation, processing or storage, or by a long storage period.

Cooking with Kraut

For full flavor, just heat sauerkraut through. But to make it more interesting and mellow, add a little brown sugar, chopped apple and onion, and simmer slowly. Rinsing kraut with water before using it will produce a milder flavor and also remove some of the salt.

Sauerkraut can be used in appetizers, dips, soups, relishes, salads, entrées and even desserts. It is also a good vegetable companion for corned beef, spareribs, frankfurters, sausages, pork hocks, poultry or game.

A newer way to use kraut is as a sauce, dip or potato topping. Puréed sauerkraut, called kolé, is mixed in equal amounts with plain yogurt or with mayonnaise. To make a flavorful topping for baked potatoes or a dip for chips and vegetables, add herbs, chili sauce, hot taco or pepper sauce, chopped meats or seafood such as clams. If the flavor seems too acidic, smooth it out with a pinch of baking soda. Yogurt kolé is a low-calorie taste treat.

Sauerkraut Salad

1 pint sauerkraut (2 cups), undrained
½ cup green pepper, chopped (fresh or frozen)
¼ cup pimento, chopped (canned) or sweet red pepper (fresh or frozen)
¼ cup onion, chopped
½ cup granulated sugar

Mix all ingredients together. Refrigerate a few hours before using to allow flavors to blend. Salad can be stored in the refrigerator 2 to 3 weeks.

Bratwurst Casserole (Yield: 4 servings)

12 ounces smoked, cooked bratwurst links, cut in thirds
2 cups sauerkraut, drained
2 medium apples, cored and thinly sliced
¼ cup raisins
¼ cup onion, finely chopped
2 tbsp brown sugar
2 tsp caraway seed (optional)
1 cup beer or apple juice
1 tbsp lemon juice
2 tbsp all-purpose flour
¼ cup cold water

Mix all ingredients together. Place in casserole dish and bake at 350°F for 45 to 50 minutes.

Sources

National Center for Home Food Preservation: http://nchfp.uga.edu/
USDA Complete Guide to Home Canning, 2015
Adapted from Make Your Own Sauerkraut. Mary E. Mennes. University of Wisconsin-Extension, Cooperative Extension. B2087 (Revised 1994)

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Sauerkraut

Yield: About 1 quart

Large head of cabbage, at least 2 pounds
4 teaspoons canning or pickling salt

1. Discard outer leaves. Rinse cabbage head under cold running water and drain. Cut in quarters and remove cores. Shred or slice to a thickness of a quarter.
2. Put 2 pounds of shredded cabbage in a large metal mixing bowl. Add salt. Mix thoroughly, using clean hands until salt draws juices from the cabbage.
3. Using a funnel, put brined cabbage into large glass canning jar. Be sure container is deep enough so that its rim is at least 4 or 5 inches above the cabbage.
4. If juice does not cover cabbage, add boiled and cooled brine (**1-1/2 tablespoons of salt per quart of water**).
5. Add plastic freezer bag filled with extra brine to weight down cabbage. Cover with a clean towel or a fermentation lid. Keep the kraut under the brine at all times.
6. Store at 70° to 75°F while fermenting. At temperatures between 70° and 75°F, kraut will be fully fermented in about 3 to 4 weeks; at 60° to 65°F, fermentation may take 5 to 6 weeks. At temperatures lower than 60°F, kraut may not ferment. Above 75°F, kraut may become soft.
7. If you weigh the cabbage down with a brine-filled bag, do not disturb the crock until normal fermentation is completed (when bubbling ceases). Remove scum if it forms.
8. Fully fermented kraut may be kept tightly covered in the refrigerator for several months

Source: Adapted from the National Center for Home Food Preservation, 2018