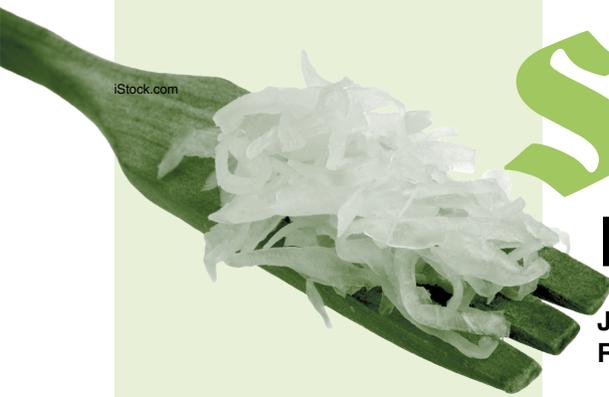


FN433 (Revised Dec. 2021)



Sauerkraut:

From Garden to Table

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If you enjoy hotdogs or bratwurst topped with sauerkraut, you aren't alone. People around the world like the distinctive flavor and texture of sauerkraut.

Sauerkraut, the German word for "sour cabbage," is produced by a fermentation process using salt and natural lactic acid bacteria found on cabbage. These bacteria break down the natural sugars in cabbage, which results in the unique product that is enjoyed in cuisine around the world.

Making sauerkraut is often part of introductory classes in microbiology. To avoid a "science experiment gone wrong" at home, follow the recommendations in this publication from garden to table.

Growing Cabbage

Danish Ballhead, Late Flat Head and Premium Late Dutch are good cabbage varieties for sauerkraut. Krautman is one of the most popular varieties for making sauerkraut, and growers are encouraged to try new varieties as well. Look for varieties that resist cabbage yellows disease. Mature heads weighing 6 to 15 pounds with a solid, white interior are most desirable.

Cabbage grows especially well in the early spring or fall months when the weather is cool and the soil is fertile. Tolerant to frosty periods at both times of the year, the best cabbage for sauerkraut are the later maturing varieties due to their higher sugar content and cooler temperatures. The varieties noted in this publication are known to be good for making sauerkraut, but don't be afraid to experiment with new introductions or varieties grown elsewhere.

With the short growing season of the upper Midwest, cabbage should be started indoors about four to six weeks prior to setting outdoors. While hardy to spring frosts, setting the plants out too early (when the temperature is consistently below 50 degrees Fahrenheit.) may result in poor head development. Approximate seed starting date is April 1 if you are going to move the plants into the garden in early May. If purchasing transplants, look for plants that have developed three to five true leaves. Allow them to harden off for three to five days before setting them into the garden because many garden centers simply produce them in greenhouse environments.

At transplanting, set the plants about 18 to 24 inches apart in the row, with 24 to 30 inches between the rows. With the square foot gardening (SFG) technique, placing them on 18- or 24-inch squares (depending on the final size expected) will maximize limited space for production. When transplanting, we suggest you give each plant a starter fertilizer such as Miracle-Gro or something similar when watering them in.



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Shallow cultivation is needed to keep the weeds at bay, as well as provide a uniform moisture supply during head formation. Most varieties of cabbage available for fresh or sauerkraut production are disease resistant, so if the water can be supplied by drip irrigation or careful hand watering to keep the water off the developing heads, you should have little to no disease problems.

Problems

Imported cabbageworm and cabbage looper are common pests. Look for white moths hovering over the plants during the day. Protection against this larval damage is a must with either *Bacillus thuringiensis* or accepted chemical insecticides such as carbaryl (Sevin). With very small plantings, the use of floating row covers will work in providing protection, provided the covering is properly secured.

Splitting of mature heads is not uncommon after a heavy rain event. To control this problem, harvest the heads as soon as they are mature, just prior to an announced rain event or, if the splitting is discovered immediately after the rain, harvest these heads immediately to prevent deterioration. Another way to prevent splitting is to cultivate heads deeply after they have matured. Some growers raise a mature cabbage in the fall and twist it to one side. In each case, this severs the side roots, which will reduce the rush of water into the heads during heavy rains.

Making Sauerkraut*

For the best sauerkraut, use firm heads of fresh, disease-free cabbage. Shred cabbage and start sauerkraut between 24 and 48 hours after harvest.

Yield: To make about 9 quarts of sauerkraut, use the following ingredient proportions:

- 25 pounds cabbage
- 3/4 cup canning or pickling salt

Preparation: Work with about 5 pounds of cabbage at a time. Discard outer leaves. Rinse heads under cold running water and drain. Cut heads in quarters and remove cores. Shred or slice to a thickness of a quarter. Put cabbage in a suitable fermentation container.

Wash hands thoroughly before beginning. For each 5 pounds of cabbage, add about 3 tablespoons of salt. Mix thoroughly, using clean hands. Pack firmly until salt draws juices from cabbage. Repeat shredding, salting and packing until all cabbage is in the container. Be sure the container is deep enough so that its rim is at least 4 or 5 inches above the cabbage.

*Source: Adapted from the "Complete Guide to Home Canning," Agriculture Information Bulletin No. 539, U.S. Department of Agriculture (1994 revision, reviewed June 2006).





Fermentation Time and Temperature

Keep cabbage 1 to 2 inches under brine while fermenting. After adding prepared cabbage and brine, insert a suitably sized glass dinner plate or glass pie plate inside the fermentation container. The plate must be slightly smaller than the container opening, yet large enough to cover most of the shredded cabbage or cucumbers. To keep the plate under the brine, weight it down with two to three sealed quart jars filled with water. Covering the container opening with a clean, heavy bath towel helps prevent contamination from insects and molds while the cabbage is fermenting. Fine-quality fermented vegetables also are obtained when the plate is weighted down with a very large clean, plastic bag filled with 3 quarts of water containing 4½ tablespoons of salt. Be sure to seal the plastic bag.

Note: If you weight the cabbage down with a brine-filled bag, do not disturb the crock until normal fermentation is completed (when bubbling ceases). If you use jars as weight, check the sauerkraut two to three times each week and remove scum if it forms.

If juice does not cover the cabbage, add boiled and cooled brine (1½ tablespoons of salt per quart of water). Add the plate and weights; cover the container with a clean bath towel. Store the fermentation container at 70 to 75 F while fermenting. At temperatures between 70 and 75 F, sauerkraut will be fully fermented in about three to four weeks; at 60 to 65 F, fermentation may take five to six weeks. At temperatures lower than 60 F, sauerkraut may not ferment. Above 75 F, sauerkraut may become soft.

Note: If the fermentations conditions are not right, sauerkraut can spoil. Finished sauerkraut should have a firm texture, and the brine should not be cloudy. If you smell a bad odor, see mold or note a slimy texture, do not taste.

When making additional batches, wash the fermentation container, plate and jars in hot, sudsy water and rinse well with very hot water before use.

Suitable Fermentation Containers, Covers and Weights

A 1-gallon container is needed for each 5 pounds of fresh vegetables. Therefore, a 5-gallon stone crock is of ideal size for fermenting about 25 pounds of fresh cabbage. Food-grade plastic and glass containers are excellent substitutes for stone crocks. (For example, the 5-gallon plastic buckets that restaurants receive pickles in make excellent fermentation containers.) Fermenting sauerkraut in quart-size and half-gallon Mason jars is an acceptable practice, but may result in more spoilage losses.

Caution: Be certain that foods contact only food-grade plastics. Do not use garbage bags or trash liners.

Preserving Sauerkraut

Fully fermented sauerkraut may be kept tightly covered in the refrigerator for several months or it may be frozen or canned as follows:

Freezing Sauerkraut: Fill pint- or quart-size bags to about 3 inches from the top of the bag. Squeeze out air, label and freeze. Bags may be placed inside rigid plastic containers for extra protection from leakage.

Canning Sauerkraut: Sauerkraut may be canned using either of these two methods:

Hot pack: Bring sauerkraut and liquid slowly to a boil in a large kettle, stirring frequently. Remove from heat and fill jars rather firmly with sauerkraut and juices, leaving ½-inch head space.

Raw pack: Fill jars firmly with sauerkraut and cover with juices, leaving ½-inch head space.

Adjust lids and process according to the recommendations in Table 1.

Note: Preheat water in canner to 140 F for raw-packed foods and to 180 F for hot-packed foods. Carefully add jars to canner with a jar lifter. Be sure the water in the canner is at least 1 inch above the jars. After the water begins to boil, set a timer for the number of minutes specified for your altitude.

Table 1. Recommended process time for sauerkraut in a boiling-water canner.

Style of Pack	Jar Size	Process Time at Altitudes of			
		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	30 min	35 min
	Quarts	25 min	30 min	35 min	40 min

Remove the jars and place on dry towels or racks, allowing at least 1 inch of space between the jars during cooling. Allow jars to cool at room temperature for 24 hours. Test lid seals. If the center of the lid is indented, wipe jar and label with date. If jars do not seal, reprocess immediately using new lids.

Storage

For best quality, store canned sauerkraut in a cool, dark place and use within one year.

Nutrition Information

A half-cup of sauerkraut has just 20 calories and provides 12 percent of the daily recommendation for fiber. If you are watching your sodium intake, however, remember that sauerkraut is fairly high in sodium. A serving of sauerkraut provides about one-third of the daily recommendation.

Nutrition Facts	
Varies servings per container	
Serving size	1/2 cup (118g)
Amount per serving	20
Calories	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 780mg	34%
Total Carbohydrate 5g	2%
Dietary Fiber 3g	12%
Total Sugars 2g	
Includes 0g Added Sugars	0%
Protein 1g	
Vitamin D 0mcg	0%
Calcium 40mg	2%
Iron 2mg	10%
Potassium 200mg	4%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

INGREDIENTS: Cabbage, salt.

Funding for this publication was made possible by the U.S. Department of Agriculture's Agricultural Marketing Service through grant AM190100XXXG028.

For more information about food preservation, visit the North Dakota State University website at www.ag.ndsu.edu/food or contact your local Extension agent.

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