# Taking a New Look at Fermented Foods

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## Introduction

The practice of fermenting foods has been around for thousands of years. According to some historians, fermentation was discovered accidentally when workers building the Great Wall in China packed some cabbages with salt in a pot, hoping to preserve them. To their surprise, when they opened the pot later, they found it bubbling and with a pleasant sour flavor. Whether you are tasting kombucha, kimchi, or other fermented food for the first time, or you want to try your hand at making a fermented product at home, this fact sheet can provide the tools to open up a new experience.

The basic method of preserving vegetables in a salty brine spread around the world, so that today, nearly every culture with access to salt makes some kind of fermented food. The simplicity of this preservation method coupled with its unique flavors and reported health benefits made fermenting food popular worldwide. Until the introduction of modern canning, fermentation was one of the chief methods people used to preserve their harvest. As people embraced pasteurization, and later commercial food manufacturing, passing on the techniques and traditions of fermentation were nearly lost. Today, there is a renewed interest in preparing fermented foods at home for several reasons. This fact sheet is designed to provide simple and safe instructions for fermenting foods in the home kitchen.

## What is fermentation?

Many foods and beverages are created through the process of fermentation: sourdough bread, yogurt, beer, wine, sauerkraut, and kombucha, to name a few. This fact sheet will focus on the fermentation of vegetables, or lactic acid fermentation. Fermentation is a process

**Image:** *Homemade sauerkraut*

where the natural bacteria found in fresh vegetables utilize the carbohydrates to reproduce and excrete lactic acid, which preserves the vegetables and creates a characteristic tangy flavor. Fermentation is primarily carried out by *Lactobacilli* bacteria, a large family of acid producing bacteria that live all around us.

### Benefits of Fermentation

As previously noted, fermentation is a means of preservation of foods — it is the original form of pickling. It creates lactic acid that gives foods a bright color and tangy flavor. In human digestion, lactic acid functions as a digestive aid — fermented foods served at a meal help stimulate the production of digestive juices. The lactic acid produced in fermented foods inhibits food spoilage bacteria, making properly fermented foods a safe form of food preservation.

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### More health benefits of eating fermented food

Not only is fermented food considered delicious by many worldwide, it is also believed to be healthful, improving digestion and overall gastrointestinal health. Fermentation improves the digestibility of foods, making nutrients more available. Some of these lactic acid-producing bacteria are considered to be probiotics, meaning they can take up residence in the gut and help bolster the microbiome. Thus, consuming ferments with live lactic acid-producing bacteria intact are especially supportive of digestive health, immune function, and general well-being.

## Techniques for fermenting vegetables

There are two main fermenting techniques: dry salting and brining. The dry salting method mixes finely chopped, sliced, or shredded vegetables with salt and allows them to macerate to release their juices. Sauerkraut is a classic dry salted ferment. When dry salting vegetables, shred them very finely with a sharp knife or grater. Mix the shredded vegetables with salt and pound and pack firmly in a jar. Juices will be released, which submerges them and starts the healthy fermentation process. Use approximately 1 tablespoon of non-iodized salt for every 2 pounds of vegetables, which will fit in a 1-quart wide mouth canning jar.

The process of brining is used when the vegetables are going to be left whole or in chunks. Dill pickles would be a classic brined ferment. For brining, large vegetable chunks are packed tightly in a jar, before adding a salt water brine to cover them. Plan on using about 1 pound of vegetables per 1-quart jar and about 2 cups of brine. Standard brine strength is 1 teaspoon salt per cup of water, which works well for most vegetables. Vegetables with a high water content, such as cucumbers or peppers, require a stronger brine, about 2 teaspoons salt per cup of water.

## Rules for successful fermentation

1. Start with vegetables that have been grown using good food safety practices.
2. Wash all surfaces and containers that will be used with hot sudsy water and rinse well before use.
3. When using a wide mouth canning jar do not overfill. Fermented vegetables are quite active and bubbly; they can ooze out of the jar if you are not careful. Fill only to the shoulder of the jar, leaving at least 2 inches of head space, when using the dry salted method. Fill to the neck of the jar if using a brine. Be sure to use non-iodized salt.
4. Do not under-fill. Leaving too much headspace in a jar will allow extra space for oxygen to collect, causing mold or scum to form on the surface. Remember, a 1-quart jar will hold 2 pounds of veggies when dry salting, and 1 pound when adding a brine.
5. Add some weight. Fermenting vegetables may float to the surface and poke up out of the brine where they may spoil. Placing a weight (such as a jar or brine-filled bag) on top to keep them submerged is a good idea.
6. Seal the jar. A lid prevents oxygen from entering the jar. However, it is important to vent the jar with a one-way valve to release the gases that form during fermentation. Several different one-way valves are available on the internet or where canning supplies are sold. If a one-way valve is not used, the gases will need to be released manually by loosening the lid occasionally. This process is called "burping" because you may hear a little burp when the pressure is released.
7. Give it time. The process of fermenting vegetables cannot be rushed. Healthy bacteria play an important role in increasing the acidity and contributing to a unique flavor. Everyone has different preferences for the flavor of ferments, but it generally will take several weeks.
8. Pay attention to the temperature. Lactic acid bacteria prefer slightly cooler temperatures than we do. A slower ferment at 60° to 70° F will yield better results than one fermented at higher temps. Look for a cool place in your home and when fermenting in the summer, plan to check your ferments often for doneness.
9. Transfer to the refrigerator. Remember, these are living foods so if left out at room temperature they will continue fermenting, becoming very sour and ripening beyond palatability and safety. Storing fermented vegetables in the refrigerator will keep them fresh and crisp for many months. The recipe that follows includes the option of processing the sauerkraut following an approved canning method.

## Sauerkraut (makes about 9 quarts)

### Ingredients:

25 pounds cabbage

¾ cup canning salt

### Directions:

For the best sauerkraut, use firm heads of fresh cabbage. Shred cabbage and start kraut between 24 and 48 hours after harvest. Work with about 5 pounds of cabbage at a time. Discard outer leaves. Rinse cabbage heads under cold running water and drain. Cut heads in quarters and remove cores. Shred or slice to a thickness of a 25-cent coin. Put cabbage in a suitable fermentation container such as a stoneware crock, large glass jar, or a food grade plastic container. Add 3 tablespoons of salt. Mix thoroughly, using clean hands. Pack firmly until the salt draws juice from the 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 to 5 inches above the cabbage. If juice does not cover cabbage, add boiled and cooled brine (1½ tablespoons of salt per quart of water). Weigh down the cabbage and cover with a clean bath towel.

Store at 70° to 75° F for fermenting. At temperatures between 70° and 75° F, kraut will be fully fermented in about 3 to 4 weeks. At 60° 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. If you weigh 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 weights you will have to check the kraut 2 to 3 times each week and remove scum if it forms. Fully fermented kraut may be tightly covered in the refrigerator for several months or it may be canned as follows.

**Hot Pack:** Bring kraut and liquid slowly to a boil in a large pot, stirring frequently. Remove from heat and fill jars rather firmly with kraut and liquid, leaving ½ inch headspace. Wipe jar rims. Adjust lids. Process 10 minutes for pints; 15 minutes for quarts in a boiling water bath.

**Raw Pack:** Fill jars firmly with kraut and liquid, leaving ½ inch headspace. Wipe jar rims. Adjust lids. Process pints for 20 minutes, quarts for 25 minutes in a boiling water bath.

Recipe source: So Easy to Preserve, 6th edition.

## Kimchi

What is kimchi? Kimchi is a flavorful, sour, salty mix of fermented vegetables and seasonings that plays an important role in Korean culture. There are more than 200 variations of kimchi; the types of ingredients and the preparation method have a profound impact on the taste. Napa cabbage, radishes, green onions, garlic, and ginger, along with a specific red pepper, influence the unique types of kimchi. Kimchi ferments much more quickly than sauerkraut; it is ready to eat within three days. The nutritional value of kimchi varies with ingredients but it is generally low in calories and contains vitamins A, C, and B complex, as well as various phytochemicals and live cultures of microorganisms that confer a health benefit to the host. Eating kimchi can be a healthful way to include more vegetables and probiotic microorganisms in the diet.

For detailed instructions on how kimchi is made visit *www.farmtotable.colostate.edu*

### Glossary of terms related to fermentation:

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| **Ferments** | Foods or beverages that have undergone a change through a chemical reaction. |
| **Lactic acid bacteria (LAB)** | Present in the soil and on foods that grow in the soil. |
| **Lactic acid fermentation** | Process of preserving foods by methods that attract naturally occurring good bacteria. |
| **Probiotic activity** | Provide the gut with bacteria that enhance immune function, improve digestion, and nutrient assimilation. |
| **Microbiome** | A community of microorganisms (such as bacteria, fungi, and viruses) that inhabit a particular environment within the human body. |
| **Dry salting** | Method of fermentation where the addition of salt creates liquid to cover the product. |
| **Brining** | Method of fermentation where a salt water solution is poured over vegetable chunks, for example. |

Tested recipes for dill pickles and sauerkraut are available at the National Center for Home Food Preservation (NCHFP) web site: (*http://nchfp.uga.edu/how/can6a_ferment.html)* NCHFP also has additional information available on suitable containers, covers, and weights for fermenting food, as well as causes and possible solutions for problems with fermented pickles.

## Conclusion

Many people have lost touch with one of the oldest and simplest ways of preserving food — fermentation. If, after sampling fermented foods, you find that you enjoy the flavors, you may want to try creating a fermented product. By following the simple steps outlined in this fact sheet you have the tools to safely experiment with fermenting foods in your own kitchen. You have the opportunity to find out for yourself how delicious and nutritious fermented food can be. The steps are simple and the benefits are many as you safely incorporate fermented food into your healthy diet. Enjoy!

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