



What do I need to know to sell Fermented Vegetables at the farmers market?

What are fermented vegetables?

Fermentation occurs when specific microorganisms (bacteria and yeasts) break down the sugars in the vegetables producing acid as a byproduct. The acid production lowers the pH of the vegetables and creates a unique, desirable flavor. This definition does not include vegetables that have been acidified or pickled by adding extra acid (for example, adding vinegar) to decrease the pH.

Some examples of commonly fermented vegetables include:

- ▶ Sauerkraut (see fig. 1).
- ▶ Olives (see fig. 2).
- ▶ Kimchi (see fig. 3).
- ▶ Pickles made without vinegar.



Figure 1. Example of sauerkraut with various types of cabbages. (Photo: Sauerkraut, Fermented, Cabbage, Vegetable, Fermentation” by edwina_mc, licensed under CC0 1.0).



Figure 2. Example of fermented olives. (Photo: Olives, Fruits, Mediterranean, Fresh, Oelfrucht, Food” by Tama66, licensed under CC0 1.0).



Figure 3. Example of kimchi. (Photo courtesy of Elisa Shackelton, Colorado State University Extension).

“This work is supported by Food Safety Outreach Program [grant no. 2016 0020-25888/project accession no. 1010671] from the USDA National Institute of Food and Agriculture”



ALL fermented foods require a facility inspection and process review by the Department of Agriculture and Consumer Services or Department of Health. Prior to their review, the state regulatory agency will likely require a process review from a process authority or someone knowledgeable in the science of fermentation.

Why ferment vegetables?

Fermenting vegetables creates a value-added product. The fermentation process preserves the food, enhances flavor and texture, and increases nutritional benefits, such as vitamin B-12.

How do I know when to stop a vegetable’s fermentation?

To meet the definition of a fermented food, the pH of the product must be below 4.6; however, if the pH is lower (at or below 4.1) harmful microorganisms are prevented from surviving in the product. Therefore, to enhance safety, it is best to continue fermenting the product to a pH of 4.1 or below.

Fermentation will continue until there are no more sugars for the microorganisms to ferment. During the fermentation process, you will likely see bubbles (gas production) rise to the top. As fermentation slows, bubbling will slow or stop altogether. This is a good visual indicator of a completed fermentation. The best way to determine if a product has completed fermentation is to measure the product’s acidity with a pH meter.

How do I monitor pH during fermentation?

For safety and regulatory compliance, you must measure the acidity of your product. The measure of acidity is called pH. It is important to measure pH using a calibrated pH meter. Inexpensive (less than \$100), reliable, and accurate pH meters are available. For accuracy and reliability, follow the manufacturer’s instructions for use and calibration. For more information on pH, please refer to VCE publication FST-58NP, “Understanding the pH of Your Food” (<https://pubs.ext.vt.edu/FST/FST-58/FST-58NP.html>).

What steps do I need to complete to sell my fermented vegetables?

1. Determine if you want your product to be unrefrigerated (shelf stable) or refrigerated.
 - **If unrefrigerated** (shelf stable), you will need to heat treat the product to prevent spoilage. Heating the product will kill fermenting microorganisms and stop the fermentation process.
 - **If refrigerated** (not heat-treated), the product should be stored, transported, and sold at or below 41 °F (5 °C).
 - If pH = 4.2-4.6, refrigeration is **required** to maintain safety and quality.
 - If pH ≤ 4.1, refrigeration is **recommended** to maintain quality.

2. Decide where you are going to produce your product.
 - Out of your inspected home kitchen?
 - Out of an inspected community or commercial kitchen?
 - Out of your retail establishment (restaurant, catering business, food truck etc.)?
3. Familiarize yourself with the regulatory process associated with your product.

If producing from a home or commercial kitchen, refer to the Virginia Department of Agriculture and Consumer Sciences’ (VDACS) Home & Commercial Kitchen-Based Businesses webpage

If producing from a retail establishment (restaurant, catering business, food truck etc.), refer to Virginia Department of Health (VDH)
4. Have your product’s pH tested as part of a process review. This may be done through a process authority, food scientist, or food testing laboratory. You can find process authorities through the Association of Food and Drug Officials (www.afdo.org/foodprocessing).
5. Complete and submit the correct application that pertains to where you will be producing your fermented vegetables.

VDACS - Application for Home Food Processing Operation or the Application for a Commercial Kitchen Food Processing Operation.

VDH – Application for inspection of a food establishment (including an application for variance request).

What is a variance?

If you are considered a retail food establishment (restaurant, food truck, grocery store, caterer, etc.) and you want to sell your product at the farmers market, you must apply for a variance as part of your application for inspection. A variance is issued by the regulatory agency allowing a business to perform a process that is not addressed in the regulation. Some of these processes include: fermentation, acidification, meat curing etc.

6. After you submit your application, the regulatory agency will contact you with further questions and/or to schedule an inspection when your application is considered complete.
7. Comply with all regulatory and labeling requirements for your product.

Why heat-treat my product?

Heat-treating your product kills microorganisms (bacteria, yeasts, etc.) that could cause illness or spoil your product. It will also kill the fermenting microorganisms. If heat-treated, your product would **not need refrigeration**.



How do I determine the heating process for my product?

To determine your heating process, you must consult a process authority or food safety expert. When you contact the process authority to test your pH, they can also help you with heat treatment, if desired.

What are some guidelines for producing fermented vegetables safely?

1. Use fresh, high-quality vegetables. Wash prior to use.
2. Use proper cleaning and sanitation practices.
3. Use food-grade storage containers and tools that are easy to clean and free from scratches, cracks, and chips.
 - The best containers to use are stainless steel, plastic, ceramic, or glass. Other metals (for example: galvanized metals, copper, pewter) may leech into the product. Ceramic crocks made prior to mid-1970s may contain lead in the coating. These are great for decoration, but should not be used for food.
4. Follow proper personal hygiene, including hand-washing.
5. Wear food-safe gloves during food handling and food preparation.
6. Chop and cut vegetables to the same size for consistent fermentation.
7. Use canning or pickling salt in your recipe. Salt enhances flavor, pulls water out of the vegetable to make brine, allows the vegetable to stay firm, and decreases the growth of unwanted microorganisms. Additives in sea salt and iodized salt can negatively affect fermentation (e.g., turn vegetables brown, cloud brine, alter pH, etc.).
8. Submerge vegetables 1-2 inches below the brine. This can be done with food-grade weights.
9. Ferment your product between 60 °F (15.6 °C) and 72 °F (22 °C). Use a calibrated thermometer to confirm temperature. Ferment at the same temperature for each batch to ensure consistent quality.
10. Measure product pH using a calibrated pH meter to confirm that your product's final pH.

What are the labeling requirements for my product?

Your product should be clearly labeled, and the label should include:

- ▶ Product identity.
- ▶ Net weight in U.S. standard weight units and metric units.
- ▶ Ingredients (by descending weight). If adding culture, it must be included in the ingredient statement.
- ▶ List of allergens.
- ▶ Name and address of manufacturer.
- ▶ Consumer storage and preparation instructions.

- ▶ If product is not heat-treated, prominently display the statement “**Keep Refrigerated**” on the label. Consider placing this statement on more than one side of your package so that consumers will see it.

How should I store and sell my fermented vegetables at the farmers market?

If selling a refrigerated product:

1. Use a container that allows for gas release. As your product continues to ferment, carbon dioxide is produced and can accumulate to dangerously pressurized levels in sealed canning jars. A plastic container with a snap-shut lid is a good choice because it allows gas to escape.
2. Store product at 41 °F (5 °C) or lower. This can be accomplished with either a refrigerator or a cooler with ice. If using ice, the following requirements should be met:
 - The product must be packed in such a way that the water from melting ice drains away from the product and into a designated area or container.
 - Avoid direct contact with water or ice because this could destroy the package or label. To do this, a secondary container (such as a plastic bag) can be used.
3. A calibrated thermometer should be used to verify that food is being maintained at or below 41 °F (5 °C). Check the temperature every hour and keep a record of temperatures to prove that the product has stayed below 41 °F (5 °C).

If selling an unrefrigerated, shelf-stable product:

1. Store and sell heat-treated, fermented vegetables in canning jars with sealed lids.
2. Store and sell your products in a cool and dry location. Heat (including storage in a sunny location, or trunk of a car) can greatly affect the quality of canned products.

Additional Resources

- Nwadike, L. 2015. *Safely Fermenting Food at Home*. Extension Food Safety Fact Sheet – September 2015. Kansas State University Agricultural Experiment Station and Cooperative Extension Service.
- USDA (United States Department of Agriculture). National Institute of Food and Agriculture. 2015. Complete Guide to Home Canning. Rev. ed. Agriculture Information Bulletin No. 539. nchfp.uga.edu/publications/publications_usda.html.