Pickling: Vinegar and Fermentation

University of California
Cooperative Extension
Master Food Preserver

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Canning 1 • 2 • 3 • 4

1. Pick
   - a tested recipe
   - your ingredients

2. Prepare your equipment
   - jars, canning pot, tools
   - the correct equipment for your recipe

3. Prepare your kitchen and yourself
   - prep all surfaces in your kitchen
   - tie back hair and put on an apron
   - wash your hands

4. Preserve
   - wash jars
   - keep jars warm in canning pot and simmer lids
   - prepare your recipe
   - fill jars observing correct headspace
   - remove air bubbles
   - wipe rims
   - place lid on, securing ring fingertip tight
   - put jars in canner keeping them upright
   - make sure jars are covered by at least 1 inch of water
   - cover and bring to a boil and begin processing time
   - when processing is complete, turn off heat, remove lid and let rest 5 minutes
   - remove jars by lifting straight up and placing them on a towel or rack to cool

For more complete information on canning, see
USDA Guide to Canning
[http://nchfp.uga.edu/publications/publications_usda.html]
or one of the Ball guidebooks.

Bread and Butter Pickles

YIELD	LEVEL OF EASE	PRESERVING METHOD
2 quarts	Easy	Water Bath Canning

INGREDIENTS (For every 2 quarts of pickles)

3 1/2 lbs pickling or Persian cucumbers
1 onion, thinly sliced
2 1/2 cups white or apple cider vinegar (5% acidity)
2 1/2 cups sugar
1 tablespoon mustard seed
2 teaspoons celery seed
2 teaspoons ground turmeric

Preserving jars with lids and bands

DIRECTIONS

Prepare Bread & Butter Pickles

Cut ends off cucumbers. Cut into 1/4 inch slices.
Combine vinegar, sugar, and spices in a medium saucepan. Heat to a boil.
Pack into jars based on ENJOY NOW or PRESERVE steps below.

ENJOY NOW (Refrigerate up to 3 months)

Pour hot pickling liquid over cucumber slices in a large bowl. Cool to room temperature, about 30 minutes.

Pack cucumber slices and onions into jars. Ladle pickling liquid over cucumbers. Place lids and bands on jars.

Refrigerate pickles. For best flavor, allow pickles to stand in refrigerator for 3weeks.

-OR-

PRESERVE (Store up to 1 year)

Prepare canner, jars, and lids according to manufacturer's instructions. The largest jar you can use for this recipe is a quart jar. Pint or half-pints can also be used. The processing time is the same.

Pack slices into hot jars. Ladle hot pickling liquid over slices leaving ½ inch headspace. Remove air bubbles. Wipe rims. Center lids on jars. Apply bands and adjust to fingertip tight.

Process in boiling water canner for 15 minutes, adjusting for altitude*. For best flavor, allow pickles to stand for 4-6 weeks.

*Increase processing time: 5 minutes for 1,001 to 3, 000 ft; 10 minutes for 3,001 to 6,000 ft; 15 minutes for 6,001 to 8,000 ft; 20 minutes for 8,001 to 10,000 ft.

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Lacto-Fermentation

Overview

Lacto-Fermentation is a metabolic process that converts sugar to acids, gases, and/or alcohol. Lactic acid bacteria breaks down a food and in the process lowers the pH of the food making it more acidic. Examples of this are cucumbers turned into pickles and milk turned into yogurt.

Lactobacillus strains are the main microorganisms in fermentation with a few other microorganisms assisting. Lactobacillus are also referred to as lactic acid bacteria (LAB). Lactobacillus, when given a favorable environment, will convert carbohydrates – sugars and starches – into lactic acid. The lactic acid environment then prevents other microorganisms from colonizing the food and prevents further decomposition. There are many different strains of lactobacillus.

Lactobacillus in conjunction with Saccharomyces cerevisiae, a yeast, will convert flour and water and give us sourdough bread. Yogurt is fermented with Streptococcus thermophilus and Lactobacillus bulgaricus.

Why do we ferment food?

We do not have to use the process of fermentation to preserve food. We have dehydration, canning, refrigeration and freezing as good methods of keeping food safe. The main reason we practice fermentation today is to take advantage of the health benefits that are realized with eating fermented foods. Fermented foods add live cultures to our food - probiotics.

Left and center jars are homemade vessels. The jar on the right is from Rancho La Merced Provisions. https://www.etsy.com/shop/RLMProvisions

How do you ferment vegetables?

Fermentation is managed by creating a favorable environment for the lactobacillus to grow. In most vegetable ferments, this is done with non-iodized salt. Limiting the exposure to air also helps this process and keeps undesirable bacteria away from the food.

Main Ingredients

Water - use non-chlorinated water. To remove chlorine, boil water and let it cool. Or use filtered water. Bottled water is fine but do not use distilled water.
Salt - non-iodized salt without any anti-caking ingredients. It is best to weigh the salt for accuracy. See below for more information.
Containers - a large food safe container with a way to keep vegetables submerged. A lid that will allow gases to escape. More on containers from the National Center for Home Food Preservation: nchfp.uga.edu/how/can_06/container_cover.html

Two main types of vegetable ferments:

- Large vegetables (cucumbers for pickles or carrot slices for escabeche) use a 5% brine
- Shredded vegetables (cabbage to make sauerkraut) use a 3% brine

The size of the vegetable determines the strength of the brine. The temperature can also make a difference in brine strength. If it is warm, a higher strength brine will help control microbial growth. Cooler temperatures can use a lower strength brine. As most of us live in the 68-72 °F range we can use the ratios below.

For a large vegetable ferment use a 5% brine and for a shredded vegetable use a 3% brine or just add salt to the vegetable to draw out the water. Weighing the salt gives a more accurate brine.

Brine Calculation

Added to 1 quart of water:
3% = 2 tablespoons of salt (weighing about 1 ounces or 27 grams)
5% = 3 tablespoons of salt (weighing about 1.6 ounce or 45 grams)
Traditionally salt is measured by volume but as salt crystals can vary the volume measured, weighing the salt is more accurate.

Direct Salting

As you do when making sauerkraut:
2 tsp (12 grams or 0.375 ounce or 3/8 ounce) per pound of vegetables

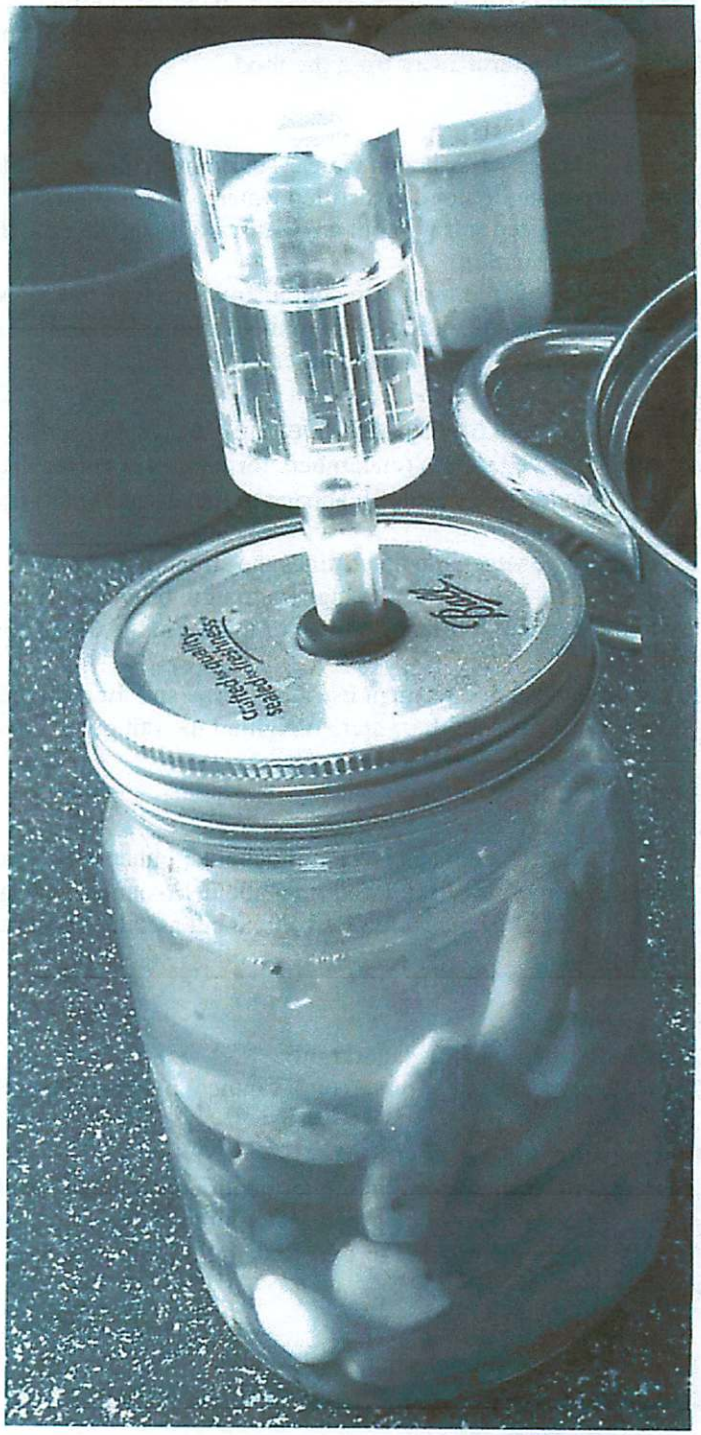
Signs of an Active Ferment

Bubbles will begin to form in the fermenting vessel and the colors of the vegetables will begin to fade. Bright greens will fade to an olive green. After a few days, taste the product and see if it is sour enough for you. Continue tasting every day or two, keeping the weight on the top of the jar clean when you remove it from the jar.

More information about salt:
http://dinersjournal.blogs.nytimes.com/2010/04/28/warning-measure-your-salt/

Helps and Hints

- An airlock system is preferred to keep your ferment clean while allowing gases to escape. You can make an airlock system with canning jars, rubber gaskets, and an airlock from a beer supply store. We used a canning lid, a 1/2 inch grommet tool to make the hole, and a rubber grommet (3/4x7/16x1/4x9/16). We also used a push pin to make a small hole, covered that with a section of rubber washer, and held in place with a small piece of masking tape.
- A weight is needed to keep your vegetables below the brine. Use a smaller canning jar with an air notch in it, a small plate, food safe plastic lids cut to fit the container, or zip top bag filled with brine.
- Check your ferment daily and remove any white scum that may form. If there is any other color or signs of mold, remove it from your ferment. Caution: if fermentation becomes soft, slimy, grows a lot of mold, or develops a disagreeable odor, discard.
- When bubbling ceases, begin tasting your ferment. When you remove the weight or bag of brine, be sure to keep it clean.
- Move completed ferment to the refrigerator.
- Fermented foods may be canned, if desired. The benefits of the live culture probiotics will be lost in the canning process.



For more information on Fermenting, visit
http://nchfp.uga.edu/how/can6a_ferment.html

Kimchi

Makes enough to fill at least 2 quart jars

Ingredients

Cabbage and Vegetables

4 pounds of Napa cabbage
1/4 cup salt (use pure salt with no additives)

Quarter the cabbage and remove core. Slice or chop the cabbage to your desired thickness. Place cabbage and salt in large bowl and massage the cabbage to release water. Let cabbage stand while you prepare additional ingredients or up to 2 hours.

Vegetables

2 bunches of green onions, roots removed, thinly slice white and green parts
1 Asian radish, grated
1 bunch of mustard greens, chopped into 1 inch pieces

Chili Paste

6 cloves of garlic
1/3 cup fresh ginger, grated
1/2 cup Korean chili flakes or powder, or more to taste
2 tablespoons of fish sauce
2 tablespoons of soy sauce
Place all ingredients into a food processor, and process to make a paste

Procedure

Combine vegetables and prepared cabbage with its liquid. Wearing gloves to protect your hands, add the chili paste and distribute it evenly through the mixture. Pack the mixture into quart jars and press down to submerge the cabbage mixture in the liquid. You can add additional liquid from the bowl as needed. Leave enough headspace to allow a 4 ounce canning jar to be placed into the quart jar. Loosely cover the jar with the lid or use an airlock system to help keep unwanted molds and yeasts out of the jar.

Allow the jars to ferment in a cool, dark place. Temperature can influence the speed of the fermentation. Check the jars daily to make sure the cabbage is submerged; remove any white film that may form.

After 2 days, check to see if you like the flavor and aroma of your kimchi. The University of Colorado Extension states that it will be finished in 2 days. When the kimchi is finished, move it to the refrigerator.

Resources:

Bauer, Laura, PhD, RD, Marisa Bunning, PhD, and HyoJung Kang. "Fermented Foods." *Farm to Table.* University of Colorado, 2013.
http://farmtotable.colostate.edu/prepare-ferment/kimchi.pdf

The Best Ball Home Canning and Preserving Recipes: Fresh Flavors All Year Long, 2016, Periodical.

Lee, Cecilia Hae-Jin. *Eating Korean from Barbecue to Kimchi, Recipes from My Home.* Hoboken: John Wiley & Sons, 2005. Print.

Basic Fermented Giardiniera

from Ernest Miller of Rancho La Merced Provisions and a Master Food Preserver
Will make approximately one quart

For the ferment:

4 ounces of carrots, peeled if desired, sliced on the diagonal, about 1/4 inch thick
4 ounces of celery, sliced on the diagonal, about 1/2 inch thick
1 bell pepper, any color or a mix, cut into batons
1 cup of bite-size cauliflower florets
1 clove of garlic, smashed
1/4 of an onion, sliced
1/2 to 1 jalapeños, sliced; remove seeds if desired, and use gloves to protect from the capsaicin
2 bay leaves
a sprig of thyme

Brine:

To make a 5% brine, dissolve 3 tablespoons salt into 1 quart of water.
Or by weight, 1.6 ounces (or 45 grams) of salt per quart of water

Procedure:

1. Layer your vegetables into your fermentation vessel, such as a glass jar or fermentation crock. Pack firmly without crushing.

2. Add the brine to your fermentation vessel until the vegetable mixture is completely submerged. You may not need all the brine or you may need more, depending on how you packed the vegetables. If all of the vegetables do not fit in the jar on the first day, save them in the refrigerator and add them the next day as the original vegetables will soften and more vegetables will then fit in the jar.

3. Place a clean weight (4 ounce canning jar or ziplock bag filled with brine) in your fermentation vessel to keep the vegetable mixture submerged.

4. Cover your fermentation vessel with a lid that hasn't been completely sealed (to allow the escape of fermentation gasses). An airlock is recommended.

5. Store out of direct sunlight at room temperature for a minimum of four days and up to two weeks while fermentation takes place. The longer the fermentation, the more sour, tangy and tart the fermentation flavors. Check fermentation daily and remove any white film that appears around the top of the jar.

6. Refrigerate and enjoy! Fermented giardiniera should last several months in the refrigerator.

Caution: If your giardiniera becomes soft, slimy, grows mold, or develops a disagreeable odor, discard.

Note: Here is a list of other traditional vegetables you can use in giardiniera:
cucumbers (usually sliced), cornichons (usually whole), fennel, pearl onions, broccoli, romanesco, peppers (all sorts), runner beans, eggplant, green tomatoes, zucchini (all summer squash), and okra. Remember though, this is not an exhaustive or exclusive list. Cured green or black olives are also a traditional option for giardiniera, but I prefer to add my olives afterwards, since they are already fermented/cured.

A number of spices and herbs are also common additions to giardiniera, such as, peppercorns, fennel seed, mustard seed, celery seed, coriander, red pepper flakes, capers, dill, chervil and oregano.

Leafy greens do not work as well in this format. They are better treated like cabbage as for sauerkraut.