FERMENTATION

University of California Cooperative Extension
Master Food Preservers
http://ucanr.edu/sites/MFPOC/

LACTO-FERMENTATION

An 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 bulgarius.

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, we like to weigh the salt.

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

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 clean when you remove it from the jar.

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

ESCABECHE

This recipe is to make a fermented jalapeño and carrot pickle similar to the pickles you would find in a taqueria. Whole or finely chopped, these pickled vegetables are a great condiment not only for tacos but in many different dishes.

Use the following quantities for a quart jar. Double for a half-gallon jar.
Warning: when working with hot peppers be sure to wear protective gloves and remember that any tools and cutting boards remain contaminated with capsaicin (the chemical that makes peppers hot) until thoroughly cleaned.

For the ferment:
1-3 jalapeños, more if desired, sliced - remove membranes and seeds as desired to control heat
1 lb. carrots, peeled and sliced on the bias
1/4 medium onion, sliced
2-3 cloves of garlic, bruised
1/2 tsp oregano, dried
1/4 tsp coriander seed
1/4 tsp cumin seed
1/4 tsp peppercorns

For the brine:
1.6 oz of pickling, canning, kosher, or sea salt (no iodine or caking agents)
1 quart of non-chlorinated water, filtered water, or bottled water

Quality: for the best quality, use deeply colored, fresh, unblemished peppers. Any variety (or combination of varieties) may be used (jalapeño, Serrano, habanero, bell, etc.) as long as they are fleshy (thick skinned). The heat of the final product will vary with the variety of pepper. Seeds and membranes may be removed to reduce heat if desired.

Procedure:
1. Toss the vegetables until thoroughly mixed.
2. Add spices to jar and transfer vegetable mixture to your fermenting vessel.
3. Add brine to your fermentation vessel until the vegetable mixture is completely submerged. You may not need all of the brine or you may need more depending on how you packed the vegetables.
4. Place a clean weight (eg. stone, glass, ziplock bag filled with brine) in your fermentation vessel to keep vegetables submerged.
5. Cover your fermentation vessel with cloth, or a lid that has not been completely sealed (to allow the escape of the fermentation gases. An airlock filled with brine is recommended.
6. Store out of direct sunlight at room temperature for a minimum of 4 days and up to 2 weeks while fermentation takes place. The longer the fermentation, the more sour, tangy and tart it will be.
7. Refrigerate and enjoy. It should last several months in the refrigerator.
Caution: if fermentation becomes soft, slimy, grows mold, or develops a disagreeable odor, discard.

SAUERKRAUT

Sauerkraut uses a different method to create the brine. You will salt the cabbage directly and the liquid released from the cabbage will form the brine.

For a quart jar:
2 lbs. **cabbage - very fresh is the best**
salt (4 tsp or if using a scale: 24 grams or 0.75 ounce or 3/4 ounce)

The process is simple:

- Clean everything well
- Slice the cabbage in half, then quarters and remove the core.
- Grate or thinly slice your cabbage
- Add cabbage and salt to a bowl and mix thoroughly, using clean hands, to draw out the water
- Pack the cabbage into a quart jar pushing down gently to help the water release
- Within 24 hours the cabbage should be covered with natural brine, if there is not enough brine covering the cabbage make a 3% solution (one quart of water mixed with 2T or 1 ounce/27grams of salt) and pour enough over the cabbage to submerge the cabbage.
- Cover with a brine-filled zip top bag or some type of weight to keep the cabbage below the brine.
- Cover but do not seal as gases need to escape. An airlock is a good idea to create a one way valve.
- Every day skim any "scum" off that appears. If any mold appears, quickly remove it.
- Depending on the temperature you are storing it in, fermentation will be done in 3-6 weeks (warmer temperatures finish earlier though may be softer). It is complete when the bubbling is finishes or the taste is acceptable to you.

You can add other vegetables – hot peppers slices, shredded carrots, red cabbage and more. When it is as sour as you would like you can move it the refrigerator where it will last for at least 3 months as long as it is kept submerged in liquid, or it can be processed with a waterbath canner.

If you choose to can the sauerkraut you will lose the live active cultures in the process. For canning the sauerkraut, use the guidelines at nchfp.uga.edu/how/can_06/sauerkraut.html

Caution: if fermentation becomes soft, slimy, grows mold, or develops a disagreeable odor, discard.

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
nchfp.uga.edu/how/can6a_ferment.html