THE CULTURED GURU
SCHOOL OF FERMENTATION

The Fermented Foods Semester

Vine & Root Vegetables

Lesson Four Workbook

01 The Timeline & The Microbes

This topic takes us on a journey through the microbial processes that occur during wild vegetable fermentation. Learn about an alternate process: Wild Heirloom Culturing.

02 How to Make Fermented Pickles

Learn through a step-by-step tutorial how to make delicious and nutritious wild fermented Pickles. Apply this process to other"vine-growing" vegetables.

03 How to Make Wild Heirloom Cultured Vegetables

Learn through a step-by-step tutorial how to make delicious and nutritious wild heirloom cultured root vegetables. Apply this process to any vegetable.

04 Troubleshooting Intensive

How do you know it's safe to eat? How can you tell if you did it right? This topic will help you troubleshoot fermentation problems.

05 How to Develop Your Own Recipes

Use this topic to learn how to develop your own creative fermented vegetable recipes using wild fermentation **or** wild heirloom culturing.

topics

topic one

01 THE FERMENTATION TIMELINE & THE MICROBES

This topic takes us on a journey through the microbial processes that occur during wild vegetable fermentation.

Vegetable fermentation specifically refers to a microbial process called lactic acid fermentation.

For lactic acid fermentation to occur, something called bacterial succession has to happen.

Learn about an alternate process: Wild Heirloom Culturing.

FERMENTATION TIMELINE

Vegetable fermentation specifically refers to a microbial process called lactic acid fermentation. This process occurs in three main stages.

01

STAGE ONE

Stage one of microbial fermentation begins as soon as you add the salt to your vegetables. Many bacteria are naturally on your vegetables that can tolerate salt. The ones that utilize oxygen thrive first, and they create an anaerobic (no oxygen) environment.

02

STAGE TWO

The second stage begins about two or three days past the start of fermentation. It's the bubbly stage! *Leuconostoc* species are Gram-positive, cocci-shaped, heterolactic fermenters (heterolactic means producing two different acids.) They produce lactic acid, ethanol, carbon dioxide, and small amounts of acetic acid and glycerol.

03

STAGE THREE

Stage Three begins after about 5-7 days (depending on what is fermented and the temperature).
The bacterial population mostly consists of *Lactobacillus* species in stage three. *Lactobacillus* species are salt-tolerant, acid-tolerant, homolactic fermenters. The one main product from their fermentation of plant sugar is lactic acid.

NOTES

topic two

02

HOW TO MAKE FERMENTED PICKLES AND OTHER "VINE-GROWING" VEGETABLES

PICKLE RECIPE

This is a recipe to make **one quart (about one liter)** of fermented pickles.

This recipe has been adjusted from the course video to be standardized for a quart-sized jar.

INGREDIENTS

- 400 grams pickling cucumbers
- 100 grams shallots and/or garlic
- 400 grams water
- 32 grams sea salt
- pickling spices (add to preference)

SUPPLIES

- 1 quart glass jar with lid
- fermentation weight
- scale
- mixing bowl
- knife and cutting board

STEP ONE

Wash your fermentation equipment (jar, weight, and lid). Gather all of your ingredients. Lightly rinse the cucumbers. Chop the cucumbers, garlic, and shallots to your preference.

STEP TWO

Place your kitchen scale on the counter. Turn it on and set it to weigh in grams. Place a mixing bowl on your kitchen scale and tare/zero the scale. This subtracts the weight of the bowl, and the scale should read 0 with the bowl on it.

STEP THREE

Weigh your ingredients: in your mixing bowl, add the designated amounts of vegetables, water, and salt. Add spices to your preference.

STEP FOUR

Mix everything thoroughly for about five minutes. This should result in enough brine to submerge the mixture in the next step.

STEP FIVE

Transfer all of the mixture, including the liquid, to your glass jar. Tamper everything down into the liquid. Place a fermentation weight in the jar and secure the lid.

STEP SIX

Allow to ferment for 14-21 days.

WILD FERMENTED VEGETABLES RECIPE

This is a recipe to make **any amount** of wild fermented vegetables you would like.

INGREDIENTS

- vegetabes
- water
- (use equal weight water and vegetables)
- sea salt

SUPPLIES

- glass jar and lid
- fermentation weight
- scale
- mixing bowl
- knife and cutting board

STEP ONE

Wash your fermentation equipment (jar, weight, and lid). Gather all of your ingredients. Lightly rinse the vegetables. Chop the vegetables to desired consistency.

STEP TWO

Place your kitchen scale on the counter. Turn it on and set it to weigh in grams. Place a mixing bowl on your kitchen scale and tare/zero the scale. This subtracts the weight of the bowl and the scale should read 0 with the bowl on it.

STEP THREE

Weigh your ingredients: weigh the vegetables and any water you're adding. Write down this weight for the next step.

STEP FOUR

Calculate the amount of salt to add by multiplying the weight of the vegetables and water by 3.5% (you can use the chart in the lesson 2 workbook to adjust the % concentration for specific vegetables).

STEP FIVE

Add the salt to the vegetables and water and mix mix mix! Mix everything thoroughly for about five minutes. This should result in enough brine to submerge the mixture in the next step.

STEP SIX

Transfer the mixture to an appropriately sized jar. Tamper everything down into the liquid. Place a fermentation weight in the jar and secure the lid.

STEP SIX

Allow to ferment for 14-21 days.

topic three

03 HOW TO MAKE WILD HEIRLOOM CULTURED VEGETABLES

WILD HEIRLOOM CULTURED CARROTS

This is a recipe to make **one pint (about 500 mL)** of wild heirloom cultured carrots.

INGREDIENTS

- 1-2 large carrots, chopped
- Sauerkraut brine
- Rice Vinegar
- Shallots, minced
- Boiling water

SUPPLIES

- 1 pint glass jar with lid
- fermentation weight
- knife and cutting board

STEP ONE

Wash your fermentation equipment (jar, weight, and lid). Gather all of your ingredients. Lightly rinse the carrots and chop them to your desired consistency. Then peel and mince the shallots.

STEP TWO

Add the chopped carrots to the jar and top with boiling water. Allow to soak for three minutes, then carefully drain off the hot water.

STEP THREE

Allow the jar to cool for five minutes, then add in the minced shallots.

STEP FOUR

Fill the jar halfway with the vinegar, then fill the rest of the jar with sauerkraut brine until the carrots are fully submerged. Place a lid on the jar, and gently invert the jar twice to mix the brine.

STEP FIVE

Option 1: Place a fermentation weight in the jar, secure the lid and allow to culture at room temperature for 48 hours before placing in the fridge.
Option 2: Place the lid on the jar and put it directly in the refrigerator.

WILD HEIRLOOM CULTURED VEGETABLES

This is a recipe to make **any amount** of Wild Heirloom Cultured Vegetables you would like.

INGREDIENTS

- vegetables
- vinegar
- sauerkraut or kimchi brine
- spices (optional)

SUPPLIES

- glass jar
- fermentation weight
- knife and cutting board

STEP ONE

Wash your fermentation equipment (jar, weight, and lid). Gather all of your ingredients. Lightly rinse the vegetables and chop all of your ingredients.

STEP TWO

Add the chopped vegetables to the jar and top with boiling water. Allow to soak for three minutes, then carefully drain off the hot water.

STEP THREE

Allow the jar to cool for a few minutes, then add in any spices you would like.

STEP FOUR

Fill the jar halfway with the vinegar, then fill the rest of the jar with sauerkraut or kimchi brine until the vegetables are fully submerged. Place a lid on the jar, and gently invert the jar twice to mix the brine.

STEP FIVE

Option 1: Place a fermentation weight in the jar, secure the lid and allow to culture at room temperature for 48 hours before placing in the fridge.
Option 2: Place the lid on the jar and put it directly in the refrigerator.

topic four

04

TROUBLESHOOTING INTENSIVE

Troubleshooting fermentation requires an understanding of what is normal and expected through the stages of fermentation. If you understand what is normal, you can notice when things are abnormal.

CHECKLIST OF SENSES

This is a checklist you can go through if you're ever wondering "is this safe?"

HOW DOES IT SMELL?

The smell is a great indicator of what's occurring in fermentation. When complete it should smell pleasantly sour. Never eat anything that smells repulsive.

WHAT'S THE COLOR?

You should notice the color of fermented vegetables beginning to change in stage two when the pH begins to drop.

DID YOU CHECK THE PH

It's easy to verify fermentation safety with pH strips. Make sure the strips measure from 0-7 on the pH scale. The pH should be below 4.0

ANY PELLICLE GROWTH?

If you do see growth on the brine surface, make sure it's not fuzzy or colorful.

IS IT STILL BUBBLY?

If the fermenting vegetables are still bubbling, then fermentation is not complete.

HOW DOES IT TASTE?

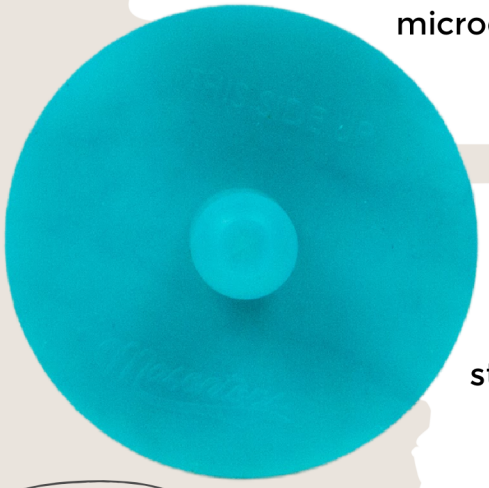
Properly fermented vegetables should taste pleasantly sour, perfectly salty, earthy, and umami.

ISSUES WITH LIDS

Special lids are not necessary. It's best to use a regular mason jar lid, or a plasic solid mason jar lid.

Silicone lids like this can be useful to have when vegetable fermentation gets bubbly. However these lids can cause major issues if they are not kept clean throughout the entire fermentation process.

When the fermentation gets bubbly, liquid, spices and vegetable pieces can get stuck in the nipple part of the silicone lid and become a breeding ground for unwanted microorganisms. The silicone is also poor quality and very porous.



These silicone lids are not “airlocks” and do not contribute to an anaerobic environment. So anything that touches the lid during the bubbly stage is not in a controlled anaerobic environment, and anything can grow on the lid.
Remember: only things below the brine, under a fermentation weight are anaerobic

That is why I only like to use these lids while the bubbles are happening.

When I use these lids during the bubbly stage, I rinse them with hot soapy water once a day.

My main goal for using lids like this is to prevent all my metal lids from bulging and getting rusty during the bubbly stage.
After the bubbling stops I always replace with a clean standard mason jar lid for the remainder of fermentation.

topic five

05

HOW TO DEVELOP YOUR OWN RECIPES

It's easy to develop your own fermentation recipes. You have to follow a few simple steps and remember to weigh all of your ingredients for consistency.

Some vegetables ferment better using wild heirloom culturing.

HOW TO DEVELOP YOUR OWN RECIPES

Get creative with fermented vegetable recipes! Just make sure to keep things consistent by weighing your ingredients and salt.

PICK YOUR FLAVOR

- Most dry spices are acceptable for use in fermentation.
- Play into the umami flavor with garlic, onion, and heat.

WEIGH YOUR INGREDIENTS

- You just need to weigh the “wet” ingredients and water.
- You do not need to weigh dry spices.
- Use this weight to calculate how much salt to add.

DETERMINE SALT CONCENTRATION

- Use the chart provided in your lesson two workbook to select the best salt concentration.
- Use wild heirloom culturing for a low-sodium fermentation option.

CALCULATE AND WEIGH YOUR SALT

- Multiply the weight of the ingredients and water by the ideal salt concentration (ex. 3.5%)
- Reference back to the math topic if you need to.

HOW MUCH WATER?

- I like to add equal parts vegetables and water for wild fermented "vine-growing" vegetables, like pickles.

HOW LONG?

- For wild fermentation: 14-21 days.
- Wild heirloom culturing only takes 48 hours.

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Kaitlynn Fenley

MICROBIOLOGIST | CEO | EDUCATOR