



PRESERVE
the **HARVEST**

Preserve the Harvest

Water Bath Canning and Pickling

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Factors for Times/Temps in Canning

Based on...

- Acidity
- Food Density
- Starting Temperature of Food...raw/cold packed or hot packed
- Size of Jar
- Altitude
- Bacteria load: Food scientists



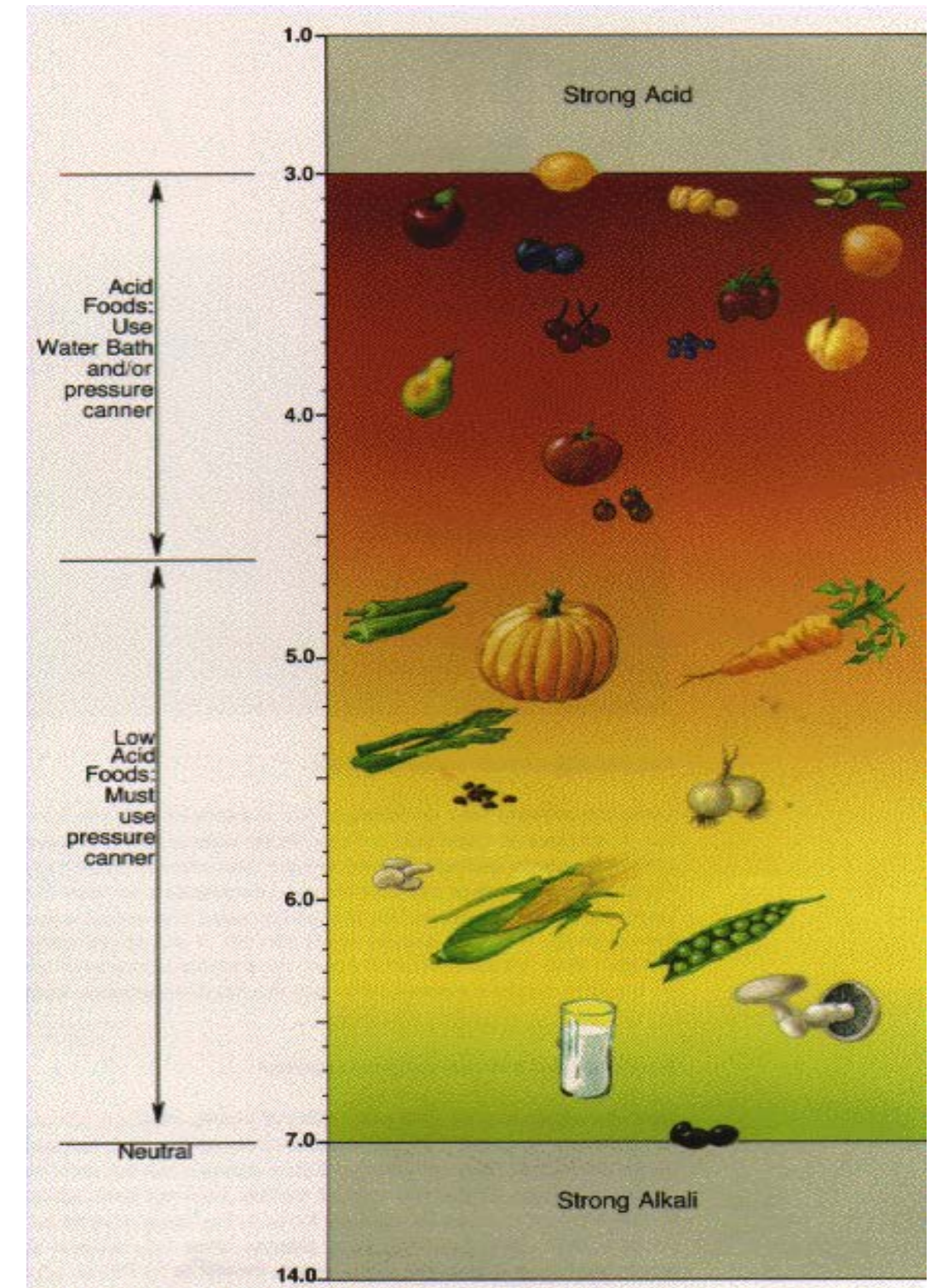
High Acid=Low pH number

High Acid	1	Low pH #
	2	
	3	
	4	
	5	
	6	
Neutral	7	Neutral pH
	8	
	9	
	10	
	11	
Base or Alkaline	12	High pH #
	13	
	14	

- ❖ Acids and Bases are measured on a pH scale.
- ❖
- ❖
- ❖ Seven is neutral like water.
- ❖
- ❖
- ❖ A food with a pH of 4 is more acidic than a food with a pH of 7, so it has a higher acid content but it has a lower pH number.

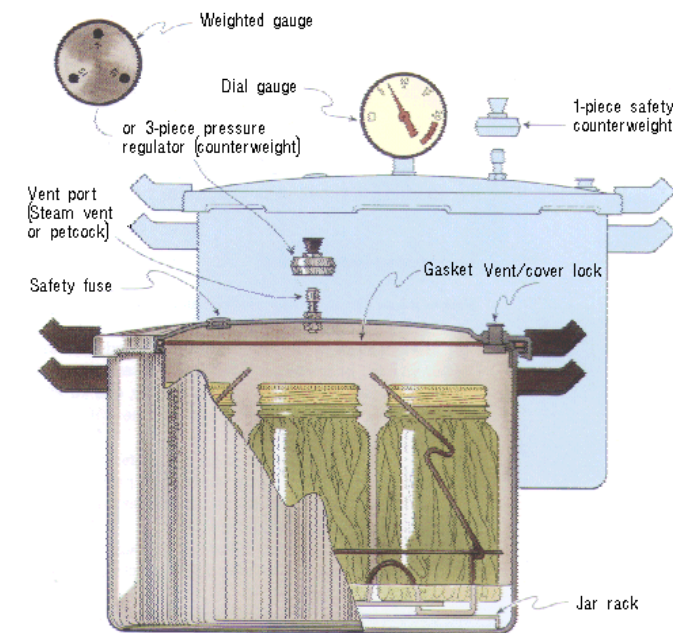
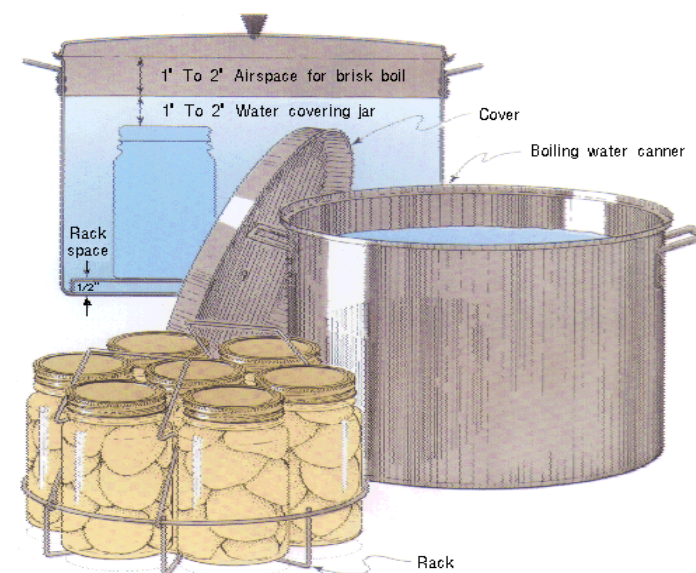
Acidity

- 4.6 is cut-off point for boiling water bath.
- 4.6 to 7.0, use pressure canner!! This would include all veggies, meats, dry beans, soups, etc.



Acidity and Processing

- High acid foods such as fruits and pickles use the boiling water bath method.
- Low acid foods such as meats and vegetables use the pressure canned method.



Starting Temperature



Raw Pack

- Raw food is placed in jars.
- Hot/boiling liquid is poured over food.
- Discoloration may appear earlier.
- Foods may float.

Hot Pack

- Raw foods with liquid are simmered for specific time in saucepan.
- Simmered food is placed in jars.
- Some texture may be lost.





Altitude Adjustments

Water Bath Canner

- Add 2 minutes to water bath time for every 1,000 ft. above sea level.
- **Example**
 - Weber Co. 4,500 ft.
 - How much time would we add?

Pressure Canner

- Add 1 lb. pressure for every 2000 ft.
- **Dial Gauge**
 - 1001-2000 ft.: 11 psi
 - 2001-4000 ft.: 12 psi
 - 4001-6000 ft.: 13 psi
 - 6001-8000 ft.: 14 psi
- **Weighted Gauge**
 - Altitude adjustment requires increase of 5 psi pressure.
 - 1,001 ft. and above: 15 psi

Altitude Basics

As altitude increases add...

More Time

or

More Pressure



Water Bath Canning Equipment

- Water bath canners
- Steam canner
- Jars, lids and rings
- Tools to make the job easier...canning funnel, ladle, blanching saucepan, jar lifter, fill gauge.





Water Bath Canners

- Deep/large enough to hold 7 quarts covered with water (Smaller for pints).
May use a pressure canner, but do not fasten lid.
- Rack to lower/lift jars from water, or to rest jars on.
- Lid/cover.





Steam Canners

- High acid food
- Heat jars before filling
- Short process time...less than 45 minutes
- Do not lift dome before time is up
- Do not add more water to the water base during processing
- Cool jars without draft or forced cooling





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Jars

- Use standard canning jars in appropriate size:
 - Half-pint, pint, or quart.
 - Two-quart for high acid juice only.
 - Wide mouth or regular...personal preference and ease.
 - No old mayonnaise jars...thinner glass and seam structure. Rim not always the same design.
- Free of cracks and chips, especially around the rim, so as to prevent sealing failure and breakage.
- Metal cans are not recommended.
- Sterilize jars if processing time is less than 10 minutes.



Lids

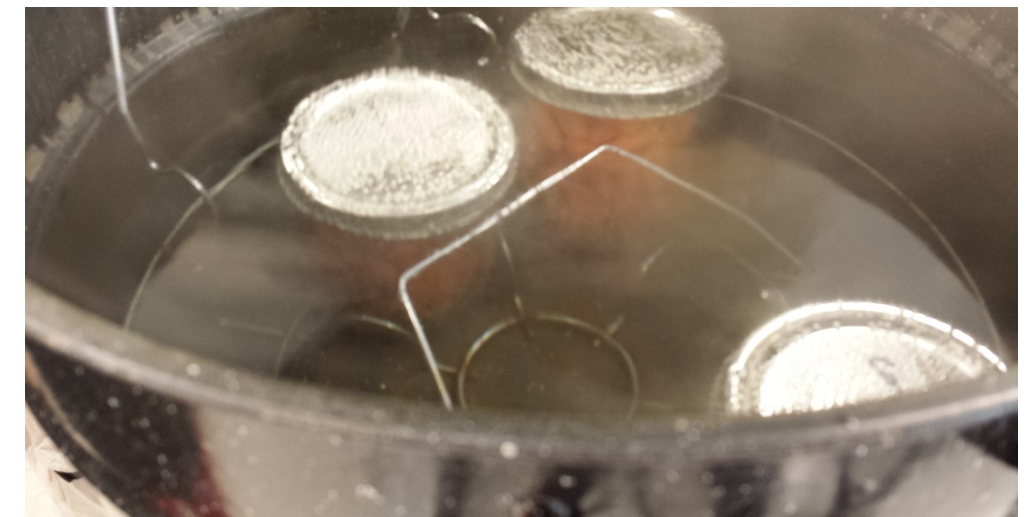
- Follow directions on the box for tightening the jar lids properly and heating.
 - Sterilize lids if processing time is less than 10 minutes.
 - Too tight: air can't escape, buckling, food discoloration and jar breakage.
 - Too loose: liquid escapes, seal fails.
 - **DO NOT** readjust the lid after processing!





Processing in a Water Bath Canner

- Fill canner halfway with water.
- Heat water to 140°F for raw pack foods; 180°F for hot pack.
- Load filled jars onto canner rack (lids/rings).
- Lower rack into canner and add more water to cover jars 1".
- Bring water to a boil and start time according to recipe/altitude.
- Cover canner w/ lid.
- Lower heat to maintain a slow boil.





Proper Canning Practices

- Select good quality food.
- Follow approved recipes.
- Fill immediately into jars, leaving appropriate headspace.
- Sterilize jars if processing time is less than 10 minutes.
- Get bubbles out.
- Wipe rims of jars.
- Apply and tighten lids and rings.
- Process jars for correct time/pressure for the altitude.
- Cool jars 12-24 hours to form vacuum seal.
- Store in cool, dark and clean location without rings.

Filling the Jars

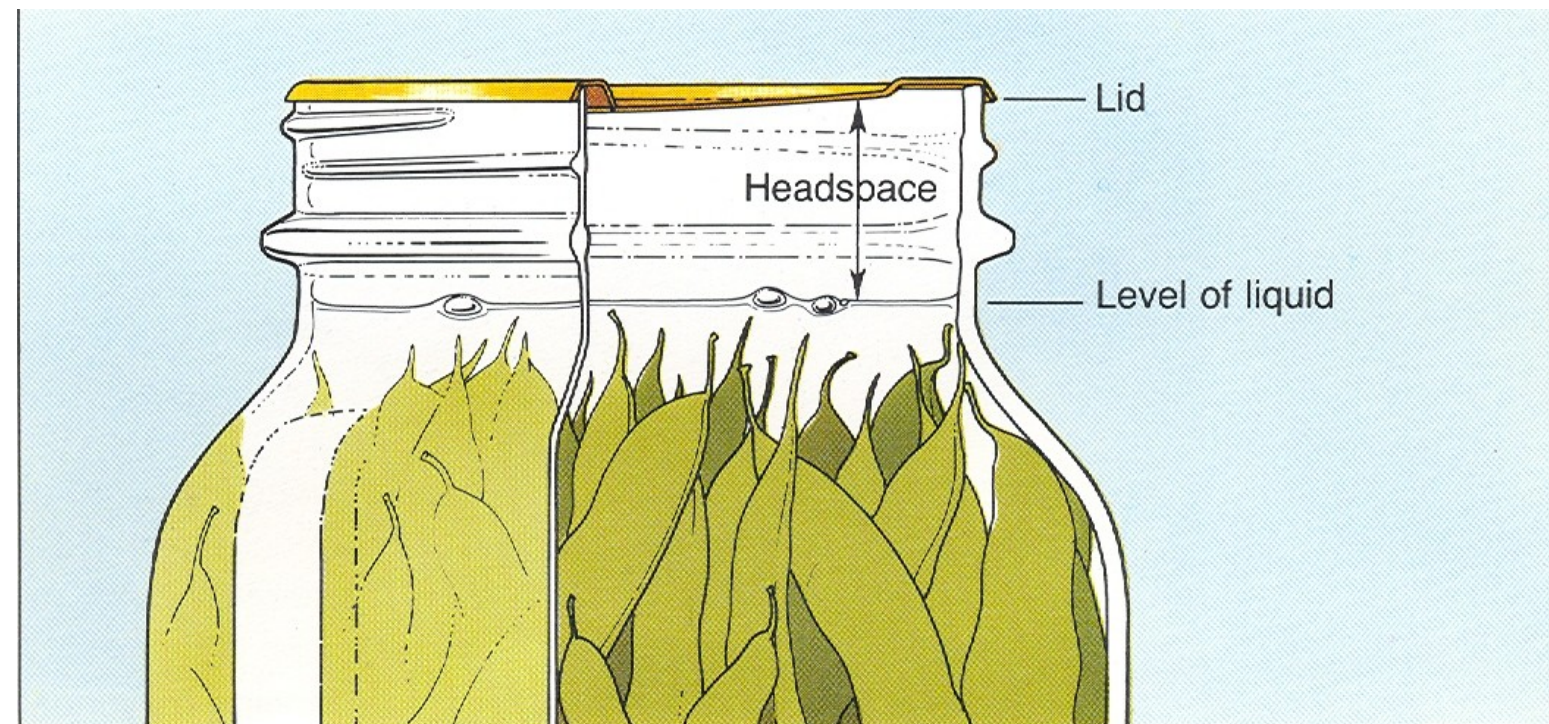
- Fill jars with food/liquid.
- Remove air bubbles with a rubber spatula.
- Wipe down lid and mouth.
- Put on screw band.
- When cooled, remove screw band/ring, wash, dry and store. Band/ring may become difficult to remove, may rust and may not work properly again if left on.





Note about Headspace

- Jams and jellies: $\frac{1}{4}$ inch
- Fruits, pickles, tomatoes: $\frac{1}{2}$ inch
- Low-acid foods: 1-1 $\frac{1}{4}$ inches





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Testing the Seal





Reprocessing?

- If any jar fails to seal or is suspected of not being fully and properly processed it MUST be –
- Immediately refrigerated, then reprocessed (full time with new lids, within 24 hours)
- Or eaten/used up
- Or frozen





Possible Reasons Lid Did Not Seal

- Incorrect headspace used.
- Food left on the jar rim.
- Damaged lids or jars.
- Air bubbles not removed.
- Not processed for the correct time.
- Siphoning.



What causes siphoning?



What is “Pickling”?



- Method of preserving food (extending the shelf life) by either:
 - using a salt brine (causing fermentation)
 - and/or using vinegar (pickling)
- Not all fermented foods (sourdough, yogurt, kefir) are pickles and not all pickles are fermented.
- Foods that are pickled are those preserved in an acidic brine/solution—the pickling comes from vinegar. They, however, are not fermented.
- Many foods can safely be “pickled.”



Types of Pickles



- Fermented-cured in salt/salt brine
- Non-fermented-vinegar pickling
 - Fresh Pack or Quick Process Pickles
 - Combined with hot vinegar and spices
 - Can also include fruit pickles and relishes which are cooked and seasoned in either a sweet or savory vinegar solution
- NOTE: there are some pickle recipes that may combine the two...cured in brine a few days/week+, but not long enough to fully ferment, so additional acidity (vinegar) is needed for processing.



Fermented vs. Brined

Fermented

- Curing cucumbers and/or other vegetables in a salt brine for several weeks
- Salt tolerant bacteria convert CHO (sugars) in the veggie into lactic acid... increasing acidity over time
- It is the lactic acid produced during fermentation that preserves the product by raising the pH (4.6 or lower); i.e., sauerkraut, kimchi, etc.
- If not fully fermented additional acid (vinegar) must be added before processing.

Non-Fermented: Fresh Pack/Quick Pack

- Cured in a brine (salt and water) for short time-hours, not days
- Will be necessary to add an acidic brine before processing
- Curing changes color, flavor and texture



Fermented Pickles

- Good bacteria produce a tangy flavor.
- The amount of salt is key.
- Keep cucumbers beneath brine surface.
- Store between 70 - 75° F. (Can vary a bit.)
- Remove scum daily.
- Refresh brine as often as necessary.
- Use fresh brine for canning.
- Process in boiling water bath.



Changes During Fermentation

Carbohydrates

sugar → acid

Color

bright green → olive or yellow green

Tissue

chalky-white → translucent





Non-Fermentation Pickles

- Less salt brining time...hence 'fresh pack' or 'quick pack'—for crispness and flavor
- Brining used to draw water from cucumbers, which allows cucumbers to absorb more pickling solution
- Recipes may require a 'desalting' process...rinse well, or boil/soak in water or vinegar
- Acid is added in the form of vinegar to prevent botulinum growth



Steps for Fresh Pack Pickling

- Cut off blossom end and place cuke in ice water
- May be salt brined for several hours, drain/rinse, and then cover with pickling liquid...OR,
- Soak in ice water, boiling water, or simmer in water or pickling liquid
- Pack in jars
- Cover with hot pickling liquid-spices/seasoning
- Process in a boiling water bath
- Allow 3-5 weeks for flavor to develop



Ingredients

- Vinegar
- Salt
- Sugar...can use white or brown
- Spices
- Firming or crisping agents
- Water



Ingredients...Produce

- Use fresh, tender vegetables and firm fruit.
- Use vegetables and fruits for pickling that are in prime condition and harvested no longer than 24 hours in advance.
- Use recommended pickling varieties.
- Use un-waxed cucumbers.
- Store produce in refrigerator or cool, well-ventilated place if not used immediately.
- Wash produce in cold water and remove $\frac{1}{16}$ -inch slice from blossom ends of cucumbers



Vinegar

- Use cider or white vinegar or 5% acidity (50 grain).
- Cider vinegar—good flavor and aroma.
- White distilled vinegar—for light- colored fruits and vegetables for clear color.
- Difficult to know acidity in homemade vinegar...so not recommended to use in canned pickled products



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Salt in Fermentation

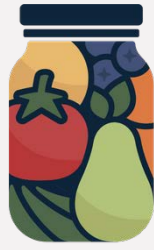
- Used to control microorganisms
- Allows specific bacteria to multiply, produces lactic acid
- Use “pickling” salt
- Do not use table salt.
 - Non-caking ingredients may cause cloudiness and interfere with fermentation
 - Iodine may cause pickles to be dark
- Do not use rock salt...not food grade





Firming Agents

- Lime—calcium hydroxide.
- Pickle Crisp—calcium chloride
- Grape or cherry leaves during brining.
- Alum—aluminum sulfate, aluminum potassium sulfate.
 - Makes pickles crisp for fermented only
 - Not needed if good quality ingredients and up-to-date methods are used.



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Lime

- Food grade ONLY!
- Found in grocery stores as pickling lime.
 - Do not use agricultural, burnt, or quick lime
 - Not calcium hydroxide-not food grade
- Lime binds with pectin substances to form insoluble calcium salts
- Problem: If not properly used, can raise pH factor of final product, making it no longer safe for water bath canning.





To Use Lime Properly

- Soak cucumbers in lime water solution 12 to 24 hours.
- Follow strict rinsing procedure.
 - Drain lime-water solution.
 - Rinse cucumbers.
 - Soak in fresh water for 1 hour.
 - Repeat rinsing and fresh water soaking step two more times.



Alum

- Can be used in fermented pickles when bottling, but is not necessary.
- Can cause digestive disturbances if too much is used or if it remains in the cucumbers.



Water

- **Use soft water for brining**
 - Hard water may interfere with formation of acid and prevent pickles from curing properly.
 - Iron – discoloration
 - Calcium—shriveling
- **To Make Water Soft:**
 - Boil water for 15 minutes.
 - Remove from heat, cover. Let stand for 24 hours.
 - Remove scum from top.
 - Slowly pour off water so sediment is not disturbed.
 - Buy bottled water...non-chlorinated, filtered, etc.



Containers/Utensils for Brining

- Stainless steel – expensive.
- Crock or stone jar.
- Un-chipped enamel lined pan.
- Large food-grade plastic jars.
- Large glass jars.
- Weight to hold vegetables in brine (heavy plate or plastic bag filled with brine).



For Heating

- Use utensils of unchipped enamelware, stainless steel, aluminum or glass.
- Do not use copper, brass, galvanized or iron utensils.
 - Reaction with acids or salts that causes color changes or formations of undesirable compounds.
- Use wooden or stainless steel spoons.



Processing

- Destroys organisms that cause spoilage and inactivates enzymes that can affect color, flavor and texture.
- #1: Process in boiling water bath for specified time for altitude.
- #2: Low temp method:
 - Place in canner with warm water
 - Cover with 165° to 180° F liquid
 - Bring water to 180°F and hold at that temp by careful heat regulation
 - Process at 180° F for 20-30 minutes (depending on altitude and product)



Common Problems...

- **Soft Pickles**
 - Too weak of a brine, not removing the scum, too warm for curing, hard water.
- **Shriveling in Pickles**
 - Cukes are not fresh, too heavy a syrup, too strong a vinegar solution, too strong of a brine at the beginning.
- **Hollow Pickles**
 - Faulty growth, improper curing, too high temperature in curing.
- **Cloudy Pickles**
 - Table salt, temperature not controlled, bacteria.



pH is Critical to Safety

- Do not change the amounts of vinegar, food or water in a recipe. Don't use a vinegar with unknown acidity. Don't use homemade vinegar.
- Only use recipes with tested amounts of ingredients.
- Quick pickle recipes must have at least as much vinegar as water to be safe.



Other Pickled Products

- Relishes
 - mixtures of veggies and/or fruits, chopped, seasoned, simmered in a sugar/vinegar solution, then packed and processed
- Beans
 - Carrots
 - Peppers
 - Asparagus
- Fruit pickles





Sauerkraut

- Shred 5 pounds of cabbage at a time.
- Add 3 tablespoons of salt/5 pounds.
- Pack in container so rim is 4 to 5 inches above cabbage.
- If juice does not cover cabbage, add boiled and cooled brine (1½-2 TBS pickling salt/quart water).
- Weigh down cabbage.
- Store at 70 to 75°F for 3 to 4 weeks.





Sauerkraut Success

- At least 1” of brine to cover cabbage.
- If, after 24-36 hours of packing the cabbage into the crock there isn't enough brine, use the brine solution recommended.
- If temperature and time are adhered to for fermenting cabbage the pH should be safe for canning (around 4.3-4.0). Litmus paper or pH meter can be used to test.
- Do not rinse or dilute any fermenting liquids when canning sauerkraut.



Other Fermented Foods

- Kombucha ('Come-boo-cha')
- Yogurt
- Kefir—milk base w/ kefir grains added—these microorganisms multiply and ferment the sugars in the milk
- Sour dough and other fermented bread leavening
- Kimchi



Kombucha

- Tea, sugar, and culture
- Typically a green or black tea base—although herbal teas or other beverage bases are being tried
- The culture (microorganisms needed) is called SCOBY (symbiotic culture/colony of bacteria and yeast)
- Use the proper steps of heating, cooling rapidly, and adding the start/culture
- Ferment the tea at 68-72°F, but do not ferment in the sun or outside where the temperature can rise too high. Cooler temperatures (62-68°F) will also work...but will be slower to reach fermentation
- Sanitation is important



Resources

- How Do I.....Pickle (NCHFP)
- So Easy to Preserve
- Ball Blue Book
- Univ. of Wisconsin Ext.
- Cornell Univ. Ext.
- Penn. State Ext.