University of California
Cooperative Extension
Master
Food
Preserver

Fruit: Preserve It, Serve It

Processes

Fall 2018

Presented by UCCE Master Food Preservers of Central Sierra
311 Fair Lane, Placerville CA 95667
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http://ucanr.edu/mfpcs

UC Master Food Preserver Program Mission:
To teach research-based practices of safe home food preservation
to the residents of California.

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Food Safety Basics

The quality of food is judged by wholesomeness, its nutritional value, and our expectations of its color, flavor, odor, and texture. The quality of preserved food varies greatly and depends mostly on the quality of the fresh food and preservation methods. High quality preserved foods are free from microbial spoilage and toxins, are pleasing to eat, and are reasonably nutritious.

Causes of Food Spoilage & Deterioration

Food spoilage is the process of food becoming unsafe or unacceptable for human consumption. There are five general causes of food deterioration:

Microbial Spoilage
The most common cause of food spoilage is the growth of bacteria, molds, or yeast that are naturally occurring microscopic organisms. Thousands of species exist in nature and are widely found in the soil, water, and air.

- Bacteria: There is a full spectrum of bacteria from desirable to deadly. *Lactobacillus* is a desirable bacteria involved in fermentation processes to produce cheese, pickles, and sauerkraut. An example of a "bad" or pathogenic bacteria is *Clostridium botulinum*, which under the right circumstances causes botulism poisoning, a very serious and sometimes deadly illness. Proper canning of low-acid foods (vegetables, fish, meat) by using a pressure canner is required to kill this odorless, tasteless, and colorless toxin.

- Molds: Molds grow on most foods and are easily recognized by their masses of fuzzy growth in a variety of colors. The roots of mold can spread invisibly through soft foods, thus removing the surface mold does not eliminate mold from the food. Molds grow best at room temperature, but some can grow (slowly) at refrigerator temperatures. They are relatively tolerant of common inhibitors, acid and salt. Molds require oxygen, so wrapping food tightly will reduce the opportunity for mold growth. Molds are easily killed by heat. Most begin to die at about 140°F and almost all are dead when food temperatures reach 190°F.

- Yeasts: Yeasts can grow with or without air and require more water than molds. Their masses in or on food appear as slime, scum, or murkiness. Yeast fermentation in food is recognized by gas bubbles, froth, or foam which result from the fermentation activity and the production of carbon dioxide gas. Depending on the specific growth conditions, yeast produce acids (vinegar), alcohol (beer and wines), or carbon dioxide (raised bread) during fermentation. This can be desirable or result in spoiled food. Yeast grow best at room temperatures and are destroyed by heating foods to temperatures of 140°F to 190°F. They grow slowly on refrigerated foods. Yeasts grow best on or in acidified foods and fruits. Yeast growth in these foods can raise the pH, changing the conditions to be more favorable for bacterial growth.

Enzyme Action
The activity of enzymes naturally present in foods results in changes in appearance, texture and flavor, and loss of vitamins. Enzymes are easily inactivated by quickly heating raw food to temperatures of 170°F to 190°F in boiling water, in steam, or with a microwave oven. This is the purpose of blanching vegetables before freezing or drying.

Oxygen
The presence of oxygen causes oxidation, which causes many color and flavor changes, including rancidity of fats. Oxygen can also increase activity of many chemical substances in food. Good airtight packaging, careful wrapping of food to exclude oxygen and vacuum packaging machines are all good ways to exclude oxygen and improve the shelf life of stored food.

Insect Infestation
Some unavoidable insect eggs are contained in freshly harvested foods. If they are not controlled, the eggs will hatch and become larvae that will burrow through these foods to eat. Inspect food carefully, use good sanitation practices, and store food in covered containers. If insects are found, locate and discard all infested foods and clean storage areas thoroughly.

Moisture Loss
Loss of moisture changes food quality. Moisture loss proceeds more rapidly at higher temperatures. Refrigeration and proper packaging of fresh food keep these changes to a minimum.

Methods of Food Preservation

Food preservation is the maintenance of safe and nutritious food for an extended period of time. The primary methods of preserving food include the following:

Refrigeration
- Retards growth of microorganisms
- Slows action of enzymes

Freezing
- Prevents growth of microorganisms, but does not necessarily kill them.
- Kills insect eggs and larvae.
- Slows, but does not stop enzymatic activity. Therefore, enzymes present in most fresh vegetables must be inactivated by blanching before freezing.
- For highest quality, lower the food temperature to 0°F as rapidly as possible and maintain a 0°F food temperature.
- Freeze only the amount you can use before its shelf life expires.
- Use packaging that is moisture proof, sealable, and oxygen impermeable to retain quality.

Canning
- With proper canning practices, air is forced from the jars, leaving a vacuum. Processing heat destroys the most heat-resistant microorganisms capable of growing in food stored at room temperature.
- The amount and method of heat processing used depends mainly on the acidity in food. Acidity may be natural, as in most fruits, or added, as in pickled food. Low-acid canned foods contain too little acidity to prevent the growth of heat-resistant bacteria. Acid foods contain enough acidity to block their growth or destroy them more rapidly when heated.

- Molds and some yeast are unable to grow in a vacuum. However, there is a very healthy growth environment for some bacteria in sealed, low-acid home-canned foods. Such foods must be heat processed until a commercially sterile product is achieved, or they must have salts, sugars, acids, or other preservatives added.
- Yeasts and molds are destroyed when food temperatures reach about 190°F, whereas most bacterial vegetative cells are destroyed in foods heated to a boiling temperature. Bacterial spores are able to survive for a long period at the temperature of boiling water.
- Pressure enables the processing of canned foods at temperatures higher than boiling water, where kill rates of bacteria are greatly increased. Pressure canning is required to safely process low-acid foods that may support the growth of bacterial spores.
- It is the scientific study and research of these food spoilers that has resulted in different canning methods (boiling water, atmospheric steam canning, and pressure canning) that allow the home canner to safely process and store foods. A list of approved sources that base their recipes and preservation methods on research findings is included on page 4 of this document and should be the exclusive reference for all home canners.

Dehydrating

- Removes water and prevents growth of microorganisms.
- Microorganisms require water for growth. Removal or reduction of water from a food prevents growth of microorganisms and controls enzyme activity.
- Dried foods must be packaged in oxygen and moisture proof containers to prevent oxidation of flavors and moisture gain.

Pickling and Fermenting

- These methods (and others, like canning naturally acidic fruits, jams and jellies) use either naturally produced or added acids to inhibit or prevent the growth of many microorganisms. Foods that contain enough acid to inhibit the growth of *Clostridium botulinum* are called high acid foods (pH lower than 4.6). The presence of acids in foods, however, does not kill organisms.
- Fermenting uses bacteria to produce lactic acid and lower the pH in products such as fermented pickles and sauerkraut.
- Pickling adds vinegar (acetic acid) to lower pH in fresh pack pickles and other acidified products.

Salting

- Chemically bonds water, inhibiting growth of some bacteria.

Sweetening and Acidifying Jellies and Jams

- Adds sugar and acids that tie up free water and lower the pH.

On Guard Against Spoilage

Don't taste or use canned foods that show any sign of spoilage! Look closely at all jars before opening them. A bulging lid or leaking jar is a sign of spoilage. When you open the jar, look for other signs, such as, spurting liquid, an off-odor or mold. Spoiled canned foods should be discarded in a place where they will not be eaten by humans or pets.

Don't taste or use <u>improperly canned, low-acid foods</u>! Low acid foods include vegetables, meat, seafood and tomatoes. Improperly canned, low-acid foods can contain the toxin that causes botulism **without showing signs of spoilage**. Jars of foods that have not been properly processed must be discarded, even if there are no signs of spoilage, or if they are unsealed, open or leaking they must be

detoxified and discarded as directed below. Low-acid foods are considered improperly canned if any of the following are true:

- The food was not processed in a pressure canner.
- The gauge of the canner was inaccurate.
- Up-to-date researched processing times and pressures were not used for the size of the jar, style of pack or kind of food processed.
- Proportions of ingredients were changed from the original approved recipe.
- The processing time and pressure were not correct for the altitude at which the food was canned.

How to Detoxify Canned, Low-Acid Foods

Contact with botulinum toxin can be fatal whether it is ingested or enters through the skin. Be extremely careful not to splash or come in contact with the suspect food or liquid. Wear disposable rubber or heavy plastic gloves. Wear clothes and aprons that can be bleached or thrown out if contaminated.

Step-by-Step Instructions for Detoxification:

- Carefully place the jars, with their lids, on their sides in an 8-quart, or larger pot or canner.
- Wash your gloved hands thoroughly.
- Carefully, without splashing, add enough hot water to the pot to completely cover the jars with at least 1 inch of water above the containers.
- Place a lid on the pot and heat the water to boiling.
- Boil for 30 minutes to make sure the food and containers are detoxified.
- Cool and discard the containers, their lids and food in the trash or dispose in a nearby landfill.

How to Clean Up Contaminated Surfaces:

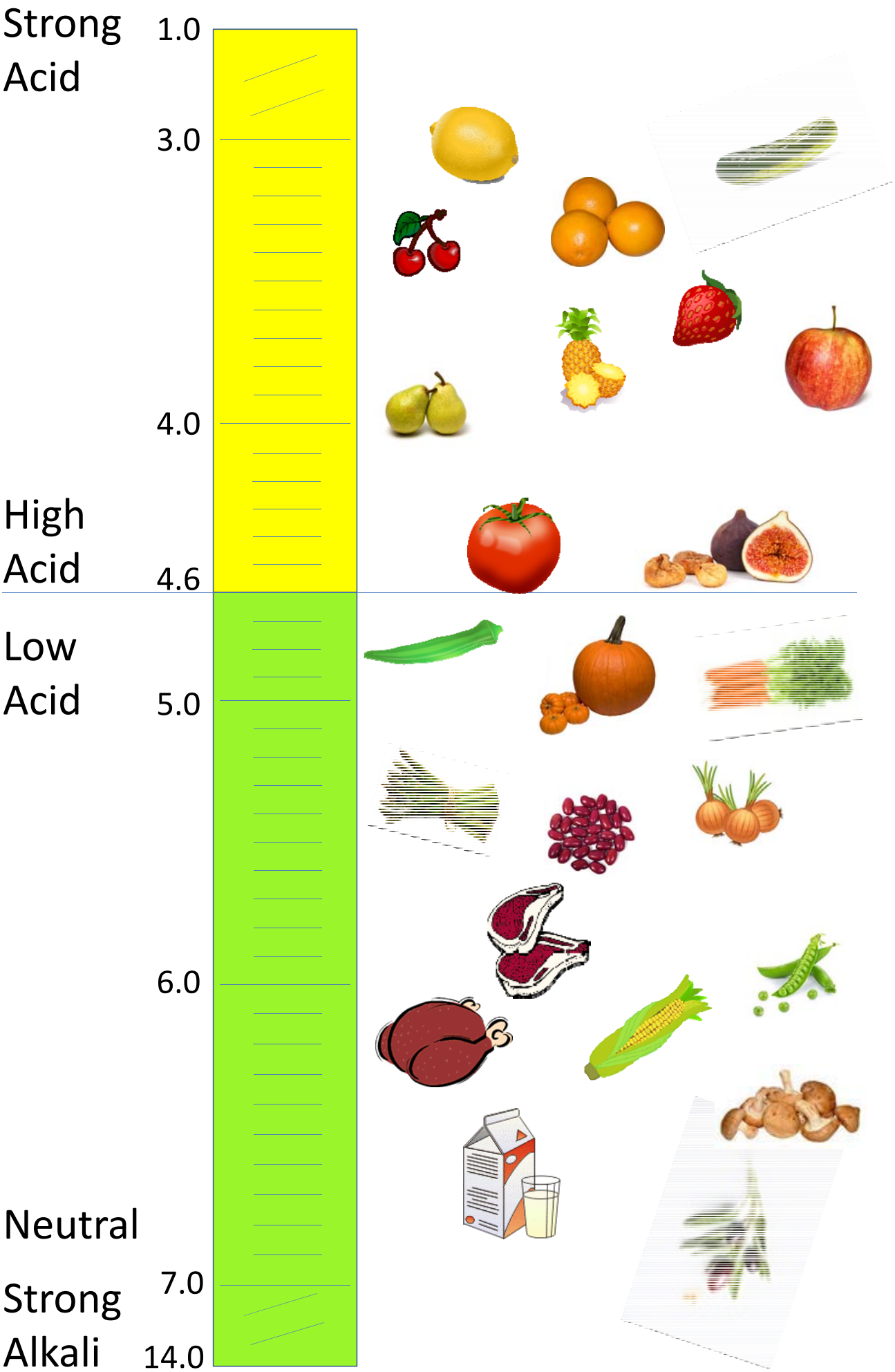
- Wear rubber or heavy plastic gloves to clean up contaminated work surfaces and equipment, including can openers and clothing that may have come in contact with suspect foods or liquids.
- Use a fresh solution of 1 part unscented, liquid, household, chlorine bleach (5 to 6% sodium hypochlorite) to 5 parts clean water.
- Spray or wet contaminated surfaces with the bleach solution and let stand for 30 minutes. Avoid inhaling bleach or contact with skin.
- Wipe treated spills with paper towels and place paper towels in a plastic bag before putting them in the trash.
- Apply the bleach solution to all surfaces and equipment again, and let stand for 30 minutes and rinse.
- Wash all detoxified counters, containers, equipment, clothing, etc.
- Discard gloves when cleaning process is complete.

A good rule to follow is: When in doubt, throw it out! If food looks or smells strange, don’t take a chance by tasting it and don’t give it to your pets or other animals. Throw it out!

Research-Based Sources

- National Center for Home Food Preservation (http://nchfp.uga.edu/)
- USDA Guide to Home Canning, 2015
- So Easy to Preserve 6th Edition, September 2014 (University of Georgia)
- Ball Complete Book of Home Preserving, 2006 and 2012
- University of California Publications
- Cooperative Extension Offices (all 50 states)
- Package inserts included with name-brand pectins

pH Value of Various Foods



Temperatures for Food Preservation

Canning temperature for low acid foods in a pressure canner

240°F

Temperature needed to destroy *Clostridium Botulinum* spores.

212°F

Canning temperature for high acid foods in either a boiling water canner or atmospheric steam canner

180°F

Water boils at 212°F at sea level and at lower temperature as altitude increases. Water simmers at around 180°F. Boiling destroys most bacteria, yeasts and molds. Time needed to kill these increases as temperature decreases.

165°F

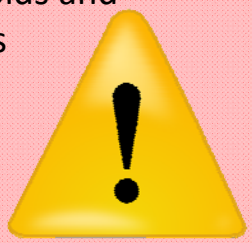
Warming temperatures prevent growth but may allow survival of some microorganisms.

140°F

Temperature range for drying foods in a dehydrator

80°F

DANGER ZONE: Temperatures in this zone allow rapid growth of bacteria, yeasts, molds and production of toxins by some bacteria and molds.



Best storage temperatures for canned and dried foods

60°F

50°F

40°F

32°F

Water Freezes

Cold temperatures permit slow growth of some bacteria, yeasts and molds.

0°F

Best storage temperatures for frozen foods

Freezing temperatures stop growth of microorganisms, but may allow some to survive.

-10°F

Cleaning & Sanitizing the Kitchen

Using inexpensive household food-safe products

TAKE A LOOK
INSIDE

Consumers can protect themselves by preventing the spread of germs by both cleaning and sanitizing surfaces where food is prepared.

Cleaning definition: removing dirt from food preparation surfaces in the kitchen. Surfaces can be counters, cutting boards, dishes, knives, utensils, pots and pans.

Cleaning steps:

1. Wash surface with soap and warm water.
2. Rinse with clean water.
3. Air dry **OR** dry with a clean paper towel.

Sanitizing definition: the reduction of germs to a safe level so illness is unlikely to occur. The most commonly known germs causing illness are *Salmonella*, *Campylobacter*, and *Norovirus*. Toxin-producing *E. coli* and *Listeria monocytogenes* are less common in the kitchen, but cause very serious, if not deadly, illnesses.

Sanitizing steps: (See the table on page two)

1. Spray surface with sanitizer of choice.
2. Leave sanitizer on the surface for the suggested amount of time.
3. Allow to air dry **OR** dry with a clean paper towel.

Effective cleaning involves both cleaning and sanitizing surfaces BEFORE and AFTER use.

Common household products effective as sanitizers on food preparation surfaces:

ITEM	CONCENTRATION	TEMPERATURE	CONTACT TIME	*LISTERIA MONOCYTOGENES*	*E. COLI*	*SALMONELLA*
Chlorine Bleach (6%)	1 scant teaspoon to 1 quart water	Room Temperature (77°F or 25°C)	1 minute	✓	✓	✓
Hydrogen Peroxide (3%)	Undiluted	130°F or 55°C	1 minute	✓	✓	✓
Hydrogen Peroxide (3%)	Undiluted	Room Temperature (77°F or 25°C)	10 minutes		✓	✓
White Distilled Vinegar (5%)	Undiluted	130°F or 55°C	1 minute	✓	✓	✓
White Distilled Vinegar (5%)	Undiluted	Room Temperature (77°F or 25°C)	10 minutes			✓
Baking Soda	Not an effective sanitizer at any temperature or time, even after 10 minutes of contact time					

✓ means that the product was effective at reducing the presence of the pathogen with more than 99.999% reduction.

Source: Yang, H., Kendall, P., Medeiros, L., Sofos, J. (2009) Inactivation of *Listeria monocytogenes, Escherichia coli* O157:H7, and *Salmonella* Typhimurium with compounds available in households. J. Food Prot. 72(6); 1201-1208

Points to remember when using household chlorine bleach:

tip

- Diluted chlorine bleach is **a very effective sanitizer**. The amount needed is very small and no chlorine residue will be left behind using a concentration of 1 scant teaspoon of chlorine bleach to 1 quart of water.
- Chlorine reacts quickly and becomes inactive quickly. Detergents and dirt inactivate chlorine; surfaces must be cleaned first to ensure effective sanitation.
- Chlorine solutions need to be made at least weekly and must be stored in a dark place.
- Do not use chlorine with added fragrance - this is not food-safe.

Steps for using vinegar OR hydrogen peroxide to sanitize:

Both products when heated will produce an odor. This odor is not harmful to you. Test sanitizer in an unseen place to be sure hydrogen peroxide will not discolor or fade the surface.

Option 1:

1. Heat either 4 oz (1/2 C) white distilled vinegar **OR** hydrogen peroxide in a sauce pan to 150°F or 66°C. (Handle **CAREFULLY** when heating as the liquids will be warm but not hot.)
2. Using a funnel pour the **warm** solution into a spray bottle.
3. Immediately spray on kitchen surfaces, counter tops, sink, refrigerator interior, faucets.
4. Let sit for 1 minute then wipe with a clean paper towel.

Option 2: *(if warming the solution is not an option)*

1. Use either 4 oz (1/2 C) white distilled vinegar **OR** hydrogen peroxide
2. Using a funnel, pour **room temperature** solution into spray bottle.
3. Spray onto kitchen surfaces, counter tops, refrigerator interior, and faucets.
4. To be effective solution **MUST sit for 10 minutes** then wipe with a clean paper towel.

WARNING: **NEVER MIX HYDROGEN PEROXIDE OR VINEGAR TOGETHER.**

How often should you sanitize?

Sanitizers kill living organisms, which is why they are so important in controlling harmful pathogens. How often should the kitchen be sanitized is best determined by your personal situation. Some questions to think about when trying to decide how often the kitchen should be sanitized are:

1. Do you have elderly people living with you?
2. Do you have someone in your house that is severely ill or immune-compromised?
3. Do you have children under the age of 5 in your home?
4. Do you have indoor or outdoor pets?

You can sanitize daily. Think about your situation and decide what is right for you.

What about "GREEN" sanitizers?

"Green" is a commonly used term by the public or the media to convey a product is "safe" for the environment. Over the past 10 years there has been an increase in the number of cleaning products labeled; "environmentally friendly", "eco-safe", and "environmentally safe" as a result of consumer demand. These terms suggest that the product is not going to cause harm to the environment; however, there is no standard or regulation for when or how these statements can be used. The Environmental Protection Agency (EPA) has started a program to help the consumer purchase environmentally safe products. Industries may submit their products to be reviewed by an EPA approved scientific team. Each ingredient in the product is reviewed for chemicals that are the least concern for their class; e.g. low concern to humans, biodegrades easily, degraded by-products will not produce pollutants, etc. If you would like more information about the EPA's Design for the Environment (DfE) program, please go to the website: *http://www.epa.gov/oppt/dfe/product_label_consumer.html.*

Look for the label!

The household products suggested for use as sanitizers at the recommended dilutions are safe for home use and are safe for the environment. Vinegar and hydrogen peroxide will not be found on the DfE website although these two products do meet the DfE criteria.

WANT TO KNOW MORE?

Check out these additional resources...

Government Food Safety Information:
www.foodsafety.gov

Centers for Disease Control and Prevention:
www.cdc.gov/foodsafety

Food Safety Information from OSU:
foodsafety.osu.edu

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Authors: Janet Buffer, Lydia Medeiros, Mary Schroeder, Patricia Kendall, Jeff LeJeune, and John Sofos

Sources:

1. Environmental Protection Agency (EPA) Design for the environment: An EPA partnership program. http://www.epa.gov/dfe/product_label_consumer.html, March 2010, Accessed May 27, 2010
2. Federal Trade Commission, Sorting out "green" advertising claims. http://www.ftc.gov/bcp/edu/pubs/consumer/general/gen02.shtm, April 1999, Accessed May 27, 2010
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4. National Restaurant Association Solutions™, ServSafe Coursebook 5th edition.
5. Office of Pollution Prevention and Toxic, Chemicals in the environment: Chlorine (CAS NO. 7782-50-5) USEPA http://www.epa.gov/chemfact/f_chlori.txt, April 1994, Accessed May 27, 2010
6. Yang, H., Kendall, P., Medeiros, L., Sofos, J. Inactivation of *Listeria monocytogenes*, *Escherichia coli* O157:H7, and *Salmonella* Typhimurium with compounds available in households. J. Food Prot 72(6); 1201-1208

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Canning

Canning Fruit Basics

Checklists: Boiling and Steam Canning

Fruit Spreads

Pickling Fruit

Chutneys & Tomatoes

Flavored Vinegars

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Canning Basics

Canning Basics

Get Ready … Be Prepared!

- Read the recipe thoroughly before you begin.
- Measure out all ingredients.
- Have all of your utensils at hand.
- Wash jars, lids and rings in hot soapy water and rinse well. (Newer boxes of lids don't require pre-heating.)
- Check jars for imperfections.
- Place clean jars into the canner and heat the jars.
- Do a "dry run" of the recipe to make sure you have all of your materials and understand the recipe.

General Canning Supplies

- Standard canning jars, rings, self-sealing one-time use lids ; no paraffin wax as a sealing agent
- Funnel
- Headspace measurer
- De-bubbler
- Jar lifter
- Tray/towel for hot jars
- Lid lifter
- Reputable recipe that follows the USDA recommended canning procedures
- Canner

Canning Processes

- Use an **atmospheric steam canner** or a **boiling water canner** for high acid foods: fruits, pickled and fermented products, jams and jellies.
- Use a **pressure canner** for low acid foods: meats, vegetables, and mixtures of high and low acid foods

Why two different processes? Low acid foods must be pressure canned because *Clostridium botulinum*, the bacteria that causes botulism, is a spore former. When conditions are not favorable for the organism to grow (high heat, dryness, etc.), the bacterial cell forms a protective structure called a spore. It takes a higher temperature than boiling to destroy the spores: 240º - 250ºF. If you do not destroy the spores in low acid foods they will germinate and produce fatal toxins in the food when it is stored on the shelf. High acid foods have enough acidity to destroy spores.

The USDA **does not** recommend the open kettle method of canning because it does not prevent all risks of spoilage. *(Open kettle canning is ladling hot foods into hot jars, applying the lids and letting them seal without processing them in a canner.)*

Raw-Pack vs. Hot-Pack Methods

Filling jars with raw, unheated food prior to heat processing is called the raw-pack method. The preferred method, filling jars with preheated, hot food prior to heat processing, is called the hot-pack method. Benefits include a tighter pack and, because food expels air when heated, less float.

Jars

Check jars, lids and bands for high quality. Wash jars, lids and bands in hot, soapy water. Rinse well. Dry bands.

Heat home canning jars in hot water, not boiling, until ready for use. Fill a large saucepan or stockpot half-way with water. You may also place them in your canner. Place jars in water (filling jars with water from the saucepan will prevent flotation). Bring to a simmer over medium heat. Keep jars hot until ready for use. You may also use a dishwasher to wash and heat jars. Keeping jars hot prevents them from breaking when hot food is added. Leave lids and bands at room temperature for easy handling.

Headspace

Headspace is the completely empty space left in the jar underneath the lid and above the food. Headspace allows for food to expand during canning without being forced out from under the lid during processing. Recommended amounts also allow for good vacuums to be formed for holding lids in place and good food quality to be maintained during storage.

Atmospheric Steam Canning Essentials

Atmospheric Steam Canning Equipment

- Shallow base pan to hold water with a fitted rack that sits on the base, with a high domed cover. The cover has one or more vent holes near the bottom.
- Some models have a temperature sensor that indicates when the steam is at the correct temperature to start timing the process.

Adjusting for Altitude

All recipes are developed using sea level as the criteria for processing times. At sea level, water boils at 212°F. At higher altitudes water boils at a lower temperature. Adjustments have to be made to ensure safe canning. Canning at any altitude higher than 1,000 ft. requires adjusting the processing time, refer to the Altitude Chart for these times.

Using an Atmospheric Steam Canner

- Use a research tested recipe and processing time developed for a **boiling water** canner when using an atmospheric steam canner. An atmospheric steam canner may be used with recipes approved for half-pint, pint, or quart jars.
- Add enough water to the base of the canner to cover the rack. (Follow manufacturer recommendations.)
- Preheat water to 140°F for raw-packed foods and to 180°F for hot-packed foods. Food preparation can begin while this water is preheating. Do not have the water boiling when you add the jars.
- Heat jars prior to filling with hot liquid (raw or hot pack). Do not allow the jars to cool before filling.
- Load filled jars, fitted with lids, onto the canner rack and place the lid on the canner base.
- Turn heat to its highest position to boil the water until a steady column of steam (6-8 inches) appears from the vent hole(s) in the canner lid. Jars must be processed in pure steam environment.
- If using a canner with a temperature sensor, begin processing time when the temperature marker is in the green zone for your altitude. If using a canner without a temperature sensor, begin processing time when a steady stream of steam is visible from the vent hole(s).
- Set the timer for the total minutes required for processing the food, adjusting for altitude. Processing time must be limited to **45 minutes or less, including any modification for elevation**. The processing time is limited by the amount of water in the canner base. When processing food, **do not** open the canner to add water.

Altitude Chart	
Altitude in feet	**Increase processing time**
1,000 – 3,000	+5 minutes
3,001 – 6,000	+10 minutes
6,001 – 8,000	+15 minutes
8,001 – 10,000	+20 minutes

- Monitor the temperature sensor and/or steady stream of steam throughout the entire timed process. Regulate heat so that the canner maintains a temperature of 212°F. A canner that is boiling too vigorously can boil dry within 20 minutes. If a canner boils dry, the food is considered under-processed and therefore potentially unsafe.
- Reduce the heat enough to maintain a steady stream of steam and if using a temperature sensor, to keep the gauge marker at the low end of the green zone. If the water is boiling too vigorously, the lid may burp, releasing steam and drawing in cold air.
- At the end of the processing time, turn off the heat and wait 3 minutes before removing the lid, lifting the lid away from you.
- Using a jar lifter, remove the jars without tipping and place them on a towel, leaving at least 1 inch spaces between the jars during cooling. Let jars sit undisturbed to cool at room temperature for 12 to 24 hours.

Boiling Water Canning Essentials

Boiling Water Canning Equipment

- Deep, non-reactive kettle, stainless steel or enamel with a bottom rack.

Adjusting for Altitude

All recipes are developed using sea level as the criteria for processing times. At sea level, water boils at 212°F. At higher altitudes water boils at a lower temperature. Adjustments have to be made to ensure safe canning. Canning at any altitude higher than 1,000 feet requires increasing the processing time, refer to the Altitude Chart for these times.

Altitude Chart

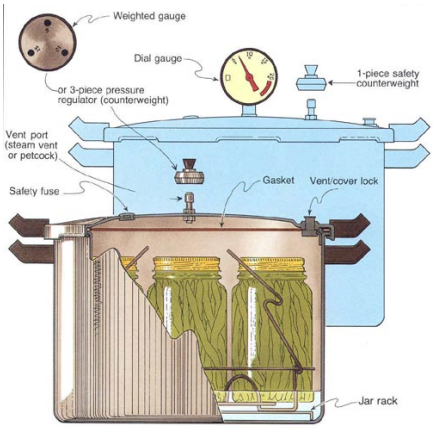
Altitude in feet	Increase processing time
1,000 – 3,000	+5 minutes
3,001 – 6,000	+10 minutes
6,001 – 8,000	+15 minutes
8,001 – 10,000	+20 minutes

Using a Boiling Water Canner

- Before you start preparing your food, fill the canner halfway with clean water. This is approximately the level needed for a canner load of pint jars. For other sizes and numbers of jars, the amount of water in the canner will need to be adjusted so it will be 1 to 2 inches over the top of the filled jars.
- Preheat water to 140°F for raw-packed foods and to 180°F for hot-packed foods. Food preparation can begin while this water is preheating. Do not have the water boiling when you add the jars.
- Load filled jars, fitted with lids, into the canner rack and use the handles to lower the rack into the water; or fill the canner with the rack in the bottom, one jar at a time, using a jar lifter. When using a jar lifter, make sure it is securely positioned below the neck of the jar (below the screw band of the lid). Keep the jar upright at all times. Tilting the jar could cause food to spill into the sealing area of the lid.
- Add boiling water, if needed, so the water level is at least 1 inch above jar tops. Pour the water around the jars, not on them. For process times over 30 minutes, the water level should be at least 2 inches above the tops of the jars.
- Turn heat to its highest position, cover the canner with its lid, and heat until the water in the canner boils vigorously.
- Set the timer for the total minutes required for processing the food, adjusting for altitude.
- Keep the canner covered and maintain a boil throughout the process schedule. The heat setting may be lowered a little as long as a complete boil is maintained for the entire process time. If the water stops boiling at any time during the process, bring the water back to a vigorous boil and begin the timing of the process over, from the beginning.
- Add more boiling water, if needed, to keep the water level above the jars.
- When the jars have boiled for the recommended time, turn off the heat and remove the canner lid. Wait no more than 5 minutes before removing jars.
- Using a jar lifter, remove the jars without tipping and place them on a towel, leaving at least 1 inch spaces between the jars during cooling. Let jars sit undisturbed to cool at room temperature for 12 to 24 hours.

Pressure Canning Essentials

Pressure Canning Equipment



- Pressure canner with the following features:
  - o Flat rack in bottom
  - o Pressure regulator or indicator
  - ✓ Dial or weighted gauge
  - ✓ Vent pipe (port) for pressurizing
  - o Safety valves or overpressure plugs
  - o Safety locks when pressurized
  - o Flexible gasket/sealing ring in lid or metal to metal seal
  - o Optional: jar stacking rack
- Please note that a pressure cooker is NOT a pressure canner, but a pressure canner can be used as a pressure cooker. A pressure cooker must be able to hold **4 quart** jars on a rack to be considered a pressure canner.

Adjusting for Altitude: Pressure Canner

Processing times for all recipes are at sea level. At sea level to 2,000 feet, 11 pounds of steam pressure will produce 240°F. Above 2,000 feet you must increase the steam pressure to reach this temperature. At altitudes above sea level adjust the pressure according to the altitude chart.

Altitude Chart	
Altitude in feet	**Required Pressure**
Sea Level – 2,000	11 lb.
2,001 – 4,000	12 lb.
4,001 – 6,000	13 lb.
6,001 – 8,000	14 lb.
8,001 – 10,000	15 lb.

Using a Pressure Canner

1. Clean lid gaskets and other parts according to the manufacturer's directions; make sure all vent pipes are clear.
2. Put 2 to 3 inches hot water (140ºF) into the canner.
3. Place filled jars on the jar rack in the canner, using a jar lifter.
4. Fasten the canner lid securely. Leave the weight off the vent pipe or open the petcock.
5. Turn the heat setting to high; heat until the water boils and steams. **Always** vent for 10 minutes.
6. Place the counterweight or weighted gauge on the vent pipe, or close the petcock.
7. Start timing the process when the pressure reading on the dial gauge indicates that the recommended pressure has been reached, or, for canners without dial gauges, when the weighted gauge begins to jiggle or rock as the manufacturer describes.
8. Regulate the heat under the canner to maintain a steady pressure at, or slightly above, the correct gauge pressure. **IMPORTANT:** If at any time pressure goes below the recommended amount, bring the canner back to pressure and begin the timing of the process over, from the beginning using the total original process time. This is important for the safety of the food.
9. When the timed process is completed, turn off the heat, remove the canner from the heat (electric burner) if possible, and let the canner cool down naturally. Do not force cool the canner. Pints take about 30 minutes to cool; 45 minutes for quarts.
10. After the canner is completely depressurized, remove the weight from the vent pipe or open the petcock. **Wait 10** minutes; then unfasten the lid away from you to remove.
11. Remove the jars from the canner by lifting them upright and placing them on a rack or folded towel away from drafts.

12. Do not retighten the rings. Leave the ring bands on the jars until they hae cooled thoroughly (approximately 24 hours). Do not try to dump or wipe up any water on the lids.
13. Dry the canner, lid and gasket. Take off removable petcocks and safety valves; wash and dry thoroughly. Follow maintenance and storage instructions that come from your canner manufacturer.

Finishing

Removing and Cooling Jars

Be careful when moving and lifting filled jars. Do not tilt. Do not be tempted to try to pour off the water on the top when lifting them out of the canner. The water on top of the hot jars will evaporate very rapidly. If the jars are tilted, food may become lodged between the glass rim and the sealing compound preventing proper sealing.
Do not leave the jars in the hot water until cooled as the jars will fail to seal, which will result in spoilage.

The Next Day …

- After cooling the jars for 12 to 24 hours, remove the screw bands.
- Check each jar for a seal; press the middle of the lid with your finger. If the lid springs up when you release your finger, the lid is unsealed.
- Clean the jars with a damp cloth. Thoroughly dry ring bands may be replaced on the jars, if desired.
- Label the jars with the product name, date, processing method (WB = Boiling Water/Water Bath, PC = pressure canner), and store in a cool, dark, dry area.
- If a jar did not seal, check the jar for flaws. Refrigerate and use the product within a few days, freeze the jar, or reprocess it within 24 hours using a new lid and if necessary, a new jar. Process by the method originally advised for the full length of time.

Boiling Water Canning Steps

1. Use reputable recipe
2. Prep food & jars
   Sterilize if <10 minutes processing
3. Heat canner water *(not boiling)*
   Hot pack: 180˚F, Raw pack: 140˚F
4. Jars in canner
   1-2" water over top of jars
5. Lid on; high heat
6. Vigorous boil? Start timing
   Adjust for altitude;
7. Adjust heat; gentle boil
8. Ding! Timer off; heat off; lid off
9. Wait ≤ 5 minutes
10. Jars out
11. Cool 12-24 hours, wash & label

Atmospheric Steam Canning Steps

1. Use reputable recipe
2. Prep food & jars
   Sterilize if <10 minutes processing
3. Heat canner water *(not boiling)*
   Hot pack: 180˚F, Raw pack: 140˚F
4. Jars in canner
5. Lid on; high heat
6. Steady column of steam? Start timing
   Green zone on temp gauge
   Adjust for altitude; Max 45 minutes
7. Adjust heat; gentle boil, steady stream
8. Ding! Timer off; heat off
9. Wait ≤ 3 minutes
10. Lid off; jars out
11. Cool 12-24 hours, wash & label

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Making and Preserving Jams, Jellies and Other Soft Spreads

Jams, jellies, and other soft spreads are foods with a variety of textures, flavors, and colors. They all consist of fruits, preserved mostly by means of sugar, and they are thickened or jellied to some extent.

Jams are made by cooking crushed or chopped fruits with sugar. They are thick, sweet spreads that tend to hold their shape but are less firm than jelly. The shape of fruit pieces are not retained when making jam. Jam has a uniform consistency and is thick enough to spread.

Jellies are usually made by cooking fruit juice with sugar and prepared in a way that keeps the juice crystal clear and shimmering. It should be firm enough to hold its shape when turned out of the container but should quiver when the container is moved. When cut, it should be tender yet retain the angle of the cut. Jelly should have a flavorful fresh fruity taste that is not too tart and not too sweet.

Preserves are small, whole fruits or uniformly sized pieces in a thick slightly gelled sugar syrup. The fruit should be tender and plump. The color should be characteristic of the fruit and fruit pieces should be translucent to clear.

Conserves are jam-like made with a combination of two or more fruits, nuts and raisins. Conserves are cooked until they round up on a spoon. If nuts are used, they can be added during the last five minutes of cooking.

Marmalades are soft fruit jellies containing small pieces or slices of fruit or fruit peel evenly suspended in the transparent jelly. They usually include citrus.

Fruit butters are soft spreads made by cooking fruit pulp with sugar to a thick spreadable consistency. They are thick enough to mound on a spoon. Spices are often added.

Basic Ingredients

For an acceptable jam or jelly, the proper proportions of fruit, sugar, acid and pectin are needed.

Fruit - The fruit gives each spread its unique flavor and color. It also supplies the liquid to dissolve the rest of the necessary ingredients and furnishes some or all of the pectin and acid. High-quality, flavorful fruits make the best jellied products.

Sugar - Sugar serves as a preserving agent, contributes flavor, and aids in gelling. Cane and beet sugar are the usual sources of sugar for jelly or jam. Corn syrup and honey may be used to replace part of the sugar in recipes, but too much will mask the fruit flavor and alter the gel structure. Use tested recipes for replacing sugar with honey and corn syrup. Do not try to reduce the amount of sugar in traditional recipes. Too little sugar prevents gelling and may allow yeasts and molds to grow.

Acid – Acid adds flavor. The proper level of acidity is critical to gel formation. If there is too little acid, the gel will never set; if there is too much acid, the gel will lose liquid (weep). For fruits low in acid, add lemon juice or other acid ingredients as directed. Commercial pectin products usually contain acids which help to ensure gelling.

Pectin - Pectin is a substance found in fruits that forms a gel if it is in the right combination with acid and sugar. All fruits contain some pectin. Those listed in Group I usually contain enough natural pectin to form a gel. Other fruits, such as those in Group III below contain little pectin and must be combined with other fruits high in pectin or with commercial pectin products to obtain gels. The following table lists the relative amount of pectin and acid for most fruits. Because fully ripened fruit has less pectin, one-fourth of the fruit should be under-ripe when making jellies without added pectin.

Table I: Pectin and Acid Content of Common Fruits Used to Make Jam and Jelly

Group I: If not overripe, has enough natural pectin and acid for gel formation with only added sugar. Group II: Low in natural acid or pectin, and may need addition of either acid or pectin. Group III: Always needs added acid, pectin or both.		
Group I	**Group II**	**Group III**
Apples, sour	Apples, ripe	Apricots
Blackberries, sour	Blackberries, ripe	Blueberries
Crabapples	Cherries, sour	Figs
Cranberries	Chokecherries	Grapes (Western Concord)
Currants	Elderberries	Guavas
Gooseberries	Grapefruit	Peaches
Grapes (Eastern Concord)	Grape Juice, bottled	Pears
Lemons	(Eastern Concord)	Plums (Italian)
Loganberries	Grapes (California)	Raspberries
Plums (not Italian)	Loquats	Strawberries
Quinces	Oranges	

Commercial Pectin by Type and Other Thickeners

Commercial pectin is extracted from apple cores or the white layers of citrus fruit and usually contains added acid to ensure jelling. With commercially available pectin, quality jams and jellies may be made with all fruits, including those low in natural pectin. For successful products, use pectin as directed and do not exchange one type of pectin for another. Measure ingredients exactly and prepare one batch at a time. Doubling a recipe may prevent proper jelling. Purchase fresh pectin each year. Old pectin may result in poor gels. Preservatives may be included in commercial pectin to prevent microbial spoilage of the finished products.

Commercially available pectin is categorized by type: regular or modified pectin. Included below are several different brands that are available locally or on the Internet.

Regular pectin is available in both liquid and powdered forms and is used primarily to make full-sugar jams and jellies. Follow the directions that come with the package and do not reduce the sugar or substitute the sugar with other types of sweeteners. Some regular pectin includes special recipes that have been formulated so that no added sugar is needed. However, each package of commercial regular pectin does contain some sugar as noted below. Artificial sweetener is often added in the recipe. The shelf life for regular pectin is one year for best results.

Modified pectin is available in powdered form and may be used to make low- and no-sugar jams and jellies and other fruit spreads with sugar substitutes or no sweeteners that are lower in calories than products made with regular pectin.

Regular Pectin

Certo® Premium Liquid Fruit Pectin is a liquid pectin which contains lactic acid and citric acid to help form a gel. Certo liquid pectin may be used for cooked or no-cook freezer jams and jellies. Do not reduce the amount of sugar or substitute artificial sweeteners. Sodium benzoate is an added preservative. One box (6 fluid ounces/two pouches) typically makes one to two batches of jam or jelly. For more information, check www.kraftfoods.com/surejell/.

Ball® RealFruit Liquid Pectin is a liquid pectin for making homemade jams and jellies which contains citric acid and lactic acid to assist in gel formation, potassium citrate to control acidity, and sodium benzoate is an added preservative. This product is formulated for less foam formation. One box (6 fluid ounces/two pouches) typically makes one to two batches of jam or jelly. For more information, check www.freshpreserving.com.

Sure-Jell® Premium Fruit Pectin (Yellow Box) is a powdered pectin for use in making cooked and no-cook freezer jams and jellies. Fumaric acid is added to assist in gel formation. No preservatives are added. Do not reduce the amount of sugar or use artificial sweeteners. One 1.75 ounce box typically makes one batch of jam or jelly. For more information, check www.kraftfoods.com/surejell/.

Ball® RealFruit Classic Pectin is a powdered pectin that can be used to make cooked jams and jellies and no-cook freezer jams. Citric acid is added to assist in gel formation and dextrose as an added sweetener. Use the amount of sugar specified in the recipes included in the package. One 4.7 ounce jar makes approximately 22 half-pints of jam or jelly. For more information, check Ball's website www.freshpreserving.com.

MCP® Premium Fruit Pectin is a powdered pectin that contains citric acid to aid in forming a gel and dextrose as an added sweetener. No preservatives are added. MCP powdered pectin may be used for cooked and no-cook freezer jams and jellies. Sugar should not be reduced or artificial sweeteners substituted. One 2 ounce box typically makes one batch of jam or jelly. For more information, check www.kraftfoods.com/surejell/.

Mrs. Wages® Fruit Pectin Home Jell is a powdered pectin that can be used for cooked jams and jellies and for uncooked freezer jams. Fumaric acid is added to ensure gel formation. Preservatives are not added. Use the exact amount of sugar required in the recipe provided with the pectin. For more information, check www.mrswages.com.

Modified Pectin

Two types of modified pectins are available for home use to make reduced calorie jams and jellies. One type will form a gel with one-third less sugar. The other type, low-methoxyl pectin, requires a calcium source for gel formation.

Sure-Jell® Premium Fruit Pectin (Pink Box) is a *modified* pectin that can be used for making cooked jams and jellies and no-cook freezer jams and jellies with at least 25% less sugar than traditional recipes, or Splenda can be added to make jam and jelly with no added sugar. Dextrose is an added sweetener and fumaric acid and sodium citrate are added to help with gel formation. For more information, check www.craftfoods.com/surejell/.

Mrs. Wages® Light Home Jell is a *low-methoxyl* powdered fruit pectin. Jams and jellies can be made with or without sugar or with artificial sweeteners using this pectin. Calcium phosphate is added to provide the calcium

necessary to form a gel without added sugar. Fumaric acid is the added acid, and potassium sorbate is included as a preservative. For more information, check www.mrswages.com.

Ball® RealFruit Low or No-Sugar Needed Fruit Pectin is a *low-methoxyl* powdered pectin that can be used to make cooked jams and jellies and no-cook freezer jams and jellies. This pectin includes dextrose as an added sweetener, citric acid to assist in gel formation, and calcium ascorbate to help retain color. Products may be sweetened with any type of sugar, honey, or artificial sweeteners or no sweetener. One 4.7 ounce jar makes approximately 22 half-pints of jam or jelly. For more information, check www.freshpreserving.com.

Pomona's Pectin® is a *low methoxyl* powdered citrus pectin with no dextrose or preservatives. Cooked jams and jellies, including freezer jam, may be sweetened with sugar, honey, agave, xylitol, fruit juice concentrate and stevia. One 1.1 ounce box typically makes two to four batches of jam or jelly. According to the manufacturer, Pomona's Pectin keeps indefinitely. For more information, check www.pomonapectin.com.

Gelatin

Gelatin, a protein substance derived from collagen, may be used in refrigerator fruit spreads. Products made with gelatin should not be processed and must be refrigerated and used within one month.

Knox Unflavored Gelatin® contains gelatin, not pectin. Gelatin is used in some jam and jelly recipes as a thickener. These products need to be refrigerated to remain thickened and to prevent mold growth. Artificial sweeteners can be used with jam and jelly recipes made with gelatin.

Methods of Making Jams and Jellies

There are two basic methods of making jams and jellies: the quick-cook method, which uses added pectin and the traditional long-boil method, which does not require added pectin. The long-boil method works best with fruits naturally high in pectin. The quick-cook method, which requires the use of commercial liquid or powdered pectin, is easier and results in a greater yield. The gelling ability of various pectins differs. To make uniformly gelled products, be sure to add the quantities of commercial pectin to specific fruits as instructed on each package. Overcooking may break down pectin and prevent proper gelling.

When using either method, make one batch at a time according to the recipe. Increasing the quantities often results in soft gels. Stir constantly while cooking to prevent burning. Recipes are developed for specific jar sizes. If jellies are filled into larger jars, excessively soft products may result. To use 4-ounce jars or 12-ounce jars for soft spreads, follow the same processing time as given for 8-ounce jars.

Making Jams and Jellies with Added Pectin (Quick-Cook Method)

Fresh fruit and juices, as well as commercially canned or frozen fruit juice, can be used with commercially prepared powdered or liquid pectin. The order of combining ingredients depends on the type of pectin used. Complete directions for a variety of fruits are provided with packaged pectin.

Jam or jelly made with added pectin requires less cooking and generally gives a larger yield. These products have more natural fruit flavors, too. In addition, using added pectin eliminates the need to test hot jams and jellies for proper jelling. Adding 1/2 teaspoon of butter or margarine with the juice and pectin will reduce foaming. However, this may cause off-flavor in long-term storage of jams and jellies.

Making Jam *Without* Added Pectin (Traditional Long-Boil Method)

Wash and rinse all fruits thoroughly before cooking. Do not soak fruit. For best flavor, use fully ripe fruit. Remove stems, skins, and pits from fruit; cut into pieces and crush. For berries, remove stems and blossoms and crush. Seedy berries may be put through a sieve or food mill. Measure crushed fruit into large saucepan using the ingredient quantities specified in Table II below.

Table II: Ingredient Quantities for Jam without Added Pectin

Fruit	Crushed Fruit (Cups)	Sugar (Cups)	Lemon (Tsp)	Yield (half-pints)
Apricots	4 to 4-1/2	4	2	5 to 6
Berries*	4	4	0	3 to 4
Peaches	5-1/2 to 6	4 to 5	2	6 to 7
*Includes blackberries, boysenberries, dewberries, gooseberries, loganberries, raspberries and strawberries.				

Add sugar and bring to a boil while stirring rapidly and constantly. This may take anywhere from 25 to 45 minutes or more. Continue to boil until mixture thickens. Use either the freezer or temperature test described below to determine when jam has reached the gel stage and is ready to be processed for long-term storage.

NOTE: Fruit spreads may be made which are lower in sugar and calories than regular jams and jellies. Low-calorie jams and jellies cannot be made by leaving the sugar out of regular jam and jelly recipes. However, reduced sugar fruit spreads can be made by boiling fruit pulp for extended periods of time, which will make a product thicken and resemble a jam, preserve, or fruit leather. Artificial sweetener may be added. For best results, add artificial sweetener after heating.

Making Jelly *without* Added Pectin (Traditional Long-Boil Method)

Making the juice is the first step in making any fruit juice jelly. Use only firm fruits naturally high in pectin. One way to quickly test for pectin is the "alcohol test". Add 1 teaspoon of juice to 1 tablespoon of rubbing alcohol. To mix, gently stir or shake the mixture in a closed container so that all the juice comes in contact with the alcohol. DO NOT TASTE – the mixture is poisonous. Fruit high in pectin will form a sold jelly-like mass that can be picked up with a fork. If the juice fails to gel or clumps into several small particles, there is not enough pectin for jelly.

Select a mixture of about 3/4 ripe and 1/4 under-ripe fruit. Do not use commercially canned or frozen fruit juices. Their pectin content is too low. Wash all fruits thoroughly before cooking. Do not soak fruit. Crush soft fruits or berries; cut firmer fruits into small pieces. Using the peels and cores adds pectin to the juice during cooking. Add water to fruits that require it, as listed below. Put fruit and water in large saucepan and bring to a boil. Simmer according to the times shown in Table III below until fruit is soft, while stirring to prevent scorching. One pound of fruit should yield at least 1 cup of clear juice and 4 cups of juice should yield about 4 half-pints.

Table III - Extracting Juices and Making Jelly without Added Pectin

			Ingredients Added to Each 4 Cup of Strained Juice		
	Cups of Water to Pound of Fruit	Minutes to Simmer Fruit before Extracting Juice	Sugar	Lemon Juice	Jelly Yield from 4 Cups of Juice (half-pints)
Apples	1	20 to 25	3 cups	2 tablespoons	4 to 5
Berries*	None or 1/4	5 to 10	3 to 4 cups	None	5 to 6
Crab Apples	1	15 to 20	3 to 4 cups	None	5 to 6
Plums	1/2	15 to 20	3 cups	None	5 to 6
*Includes blackberries, boysenberries, dewberries, loganberries, raspberries and youngberries.					

When fruit is softened, strain through a double layer of wet cheesecloth or a wet jelly bag. Allow juice to drip through, using a stand or colander to hold the bag. Pressing or squeezing the bag or cloth will cause cloudy jelly. The juice may be frozen at this time to be used another day.

Combine fruit juice with sugar and bring to a boil while stirring rapidly and constantly. This may take anywhere from 25 to 45 minutes or more. Continue to boil until mixture thickens. Use the sheet or temperature test, described below, to determine when jelly has reached the gel stage and is ready to be processed.

Tests for Proper Gelling when using the Traditional Long-Boil Method

Sheet or Spoon Test – Dip a cool metal spoon into the boiling jelly mixture. Raise the spoon about 12 inches above the pan (out of steam). Turn the spoon so that liquid runs off the side. The jelly is done when the syrup forms two drops that flow together and sheet or hang off the edge of the spoon.

Freezer Test – Remove the jam mixture from the heat. Pour a small amount of boiling jam on a cold plate or spoon and put it in the freezing compartment of a refrigerator for a few minutes. Remove it from the freezer. If the mixture gels, it should be done.

Temperature Test – Use a jelly or candy thermometer and boil until jam or jelly mixture reaches the following temperatures at altitudes of:

Sea Level	1,000 ft.	2,000 ft.	3,000 ft.	4,000 ft.	5,000 ft.	6,000 ft
220°F	218°F	216°F	214°F	212°F	211°F	209°F

Canning Jams, Jellies and Other Soft Spreads

Jams, jellies and other soft spreads are considered high-acid foods and may be safely canned using either a boiling water canner or atmospheric steam canner. Follow recipe directions for canning your product for long-term storage. As a general guideline, full-sugar jams, jellies and other soft spreads should be placed in sterilized jars and processed in a boiling water or atmospheric steam canner for 5 minutes at altitudes of 0-1,000 feet. Processing time should be increased to 10 minutes if jars have not been sterilized. Add 1 minute to the processing time for each 1,000 feet of additional altitude. The basic processing time for low- or reduced-sugar jams, jellies and other soft spreads should be increased by an additional 5 minutes to a total of 10 minutes and, again, adjusted for altitude differences by adding 1 minute to the processing time for each 1,000 feet of altitude in excess of 1,000 feet.

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Pickling Fruit

Fruit pickles are fruits that are pickled in a spicy, sweet-sour syrup. **Relishes** are prepared using chopped products and cooked in a spicy vinegar solution.

Raw (Cold) Pack Or Hot-Pack?

- The raw, or cold-pack, method means packing cold raw food into a jar, then adding boiling liquid brine. The jars are then processed in a boiling-water or steam canner. Fruits such as apricots, berries, cherries, grapes, plums, rhubarb and tomatoes are best if packed raw.
- The hot-pack method requires a short pre-cooking period (boiling or heating in some manner). Then the boiling-hot product is packed into clean jars and processed immediately. The hot-pack method is more satisfactory for some fruits and it is recommended for peaches, pears and pineapple. Benefits include a tighter pack and, because food expels air when heated, less fruit float.
- Use the method suggested in your reputable recipe for best flavor and texture.

Salt

- Use canning or pickling salt. Table salt contains anti-caking ingredients which can cloud the brine.
- Since flake salt varies in density (grain size), it is not recommended for making pickled and fermented foods. (If you must substitute Kosher salt, it is lighter than canning salt so you need to use the same amount of salt by weight, not volume. In a class experiment, **1/2 cup pickling salt = 1 cup plus 2 Tablespoons Kosher salt**.)

Vinegar

The level of acidity in a pickled product is as important to its safety as it is to taste and texture. When pickling, always use high-quality commercial vinegars with 5% acidity or higher (also listed as 50-grain). The acidity should be listed on the label; if not, assume it is not 5%.

- Do not alter vinegar, food, or water proportions in a recipe or use a vinegar with unknown acidity. Doing so may alter its preservative effect and undermine the safety of the product.
- Use only recipes with tested proportions of ingredients.
- White distilled and cider vinegars of 5% acidity are recommended. White or white wine vinegar is usually preferred when light color is desirable.
- Do not use homemade vinegar as the acidity is unknown.

Sugars

White granulated and brown sugars are most often used. Corn syrup and honey, unless called for in reliable recipes, may produce undesirable flavors.

Spices

Use fresh whole spices for the best quality and flavor in pickles. Powdered spices may cause the product to darken and become cloudy. Pickles will darken less if you tie whole spices loosely in a clean white cloth or cheesecloth bag and then remove the bag from the product before packing the jars.

For Best Results …

- Marinate refrigerator pickles in the refrigerator for at least two weeks before serving and use within 3 months.
- Store fresh-pack/quick pickles for 4-6 weeks in a cool, dry, dark place to allow the flavors to mellow and blend.

Preventing Spoilage

Pickle products are subject to spoilage from microorganisms, particularly yeasts and molds, as well as enzymes that may affect flavor, color, and texture. Processing the pickles in a boiling-water or steam canner will prevent these problems. Standard canning jars and self-sealing lids are recommended. Processing times and procedures will vary according to food acidity and the size of food pieces.

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Chutneys and Tomatoes

Chutney

Chutney is a relish-type condiment; its increasing popularity reflects the inclusion of ethnic world cuisines in the Western diet.

The term chutney includes several different varieties of sauce-type foods, drawn from traditional East Indian cuisine. The main ingredient may be an herb such as cilantro or mint; a flavoring ingredient such as coconut, onion, ginger, tamarind; or, in the most common form, chopped fruit or vegetables, simmered with spices, onion, sugar and vinegar. Fruit-based chutneys are usually cooked, then canned or refrigerated. Other chutneys like cilantro, onion, coconut, etc. are usually eaten fresh, with minimal, if any, cooking.

Fruit chutneys are most commonly available and varieties include mango, apple, apricot, cranberry, date, papaya, peach, pear, pineapple, plum, tomato and mixed fruit, to which raisins and nuts may be added to complement the texture. The result is a sweet-sour-spicy-hot versatile blend—an adventure for the taste buds.

Several different factors contribute to the 'preserved' nature of this product:

1. The acidity (low pH) of the chutney prevents growth of several spoilage and pathogenic bacteria, molds and yeasts. This acidity is derived from the added vinegar and the natural acids of the fruit.
2. Cooking the mixture to concentrate it lowers available moisture that is needed for microbial growth. The cooking step also kills most microorganisms that may be present.
3. Processing the filled jars in a canner uses additional heat to kill spoilage organisms that might contaminate the product as jars are filled and to produce a vacuum seal for later storage. If the two-piece canning lid is applied correctly, air is driven out of the headspace while the jars are in the canner and a vacuum seal is formed upon cooling. For most chutneys, a boiling water canning process is adequate, but other foods may require a pressure process.
4. During storage in the sealed jar, oxygen and additional microbial contamination is kept from the product. Too much oxygen left in the jar will cause interactions with food components that lead to quality losses (for example, undesirable changes in color, texture, and flavor).

Uses for Chutney

Chutney is a perfect accompaniment to East Indian food; however, it can also be used as a side dish, sandwich spread, dip, an accompaniment to cheese and crackers, or as an ingredient to enhance the flavor of everyday dishes like chicken salad, casseroles, omelets and grilled fish.

Chutney Ingredients

- **Tomatoes:** Use only high-quality tomatoes for canning chutneys. Avoid tomatoes that are overripe or from dead or frost-killed vines. These will result in a poor-quality and potentially unsafe product. Canning is never a good way to use overripe or spoiling tomatoes.

  Use the type of tomato specified in the chutney recipe as this will determine the final flavor profile.

Where recipes call for peeled or skinned tomatoes, remove the skin by dipping tomatoes into boiling water for 30-60 seconds or until skins split. Immerse in cold water until cool enough to handle. Slip off skins and remove cores. Remove seeds if desired.

- **Fruits:** Always select fruits in the quantity and condition described in the chutney recipe, and prepare fruits according to the directions. Common fruits used in chutneys include: Apples, apricots, cranberries, dates, prunes, bananas, cherries, kiwi, limes, lemons, oranges, rhubarb, papaya, peach, pear, nectarines, plums, raisins, mangos* as well as candied fruits or candied fruit peels.

  Caution: Handling green mangoes may irritate the skin of some people in the same way as poison ivy. (They belong to the same plant family.) To avoid this reaction, wear plastic or rubber gloves while working with raw green mango. Do not touch your face, lips or eyes after touching or cutting raw green mangoes until all traces are washed away.

- **Peppers:** Choose high-quality peppers. Always select peppers in the quantity and condition described in the chutney recipe, and prepare peppers according to the directions.

- **Acids:** Vinegar is the acid ingredient used in some chutneys to ensure a safe level of acidity. Use only vinegar that is at least 5% acid. Never use homemade vinegar because the level of acidity is variable and could result in an unsafe canned product.

  Common vinegars used in chutney are white vinegar, cider vinegar, malt vinegar, white wine vinegar and red wine vinegar. Use the flavor vinegar specified in the chutney recipe as this will determine the final flavor profile.

- **Salt:** When specified by the chutney recipe use pickling or canning salt. It contains no anti-caking agents or iodine.

- **Pickling Spice:** Some chutney recipes call for the use of pickling spice. Included in this handout is a recipe for homemade pickling spice, or use store bought pickling spice.

- **Spices:** Common spices in chutneys are: Chili powder, red pepper flakes, ginger, garlic, turmeric, curry powder (a mixture of ground spices like cardamom, cinnamon, cloves, coriander seed, cumin, fenugreek, mustard seed, nutmeg), dry mustard, salt, pepper, allspice and cayenne pepper.

- **Herbs:** Cilantro and mint are common in these recipes.

- **Other:** In addition to the above recipes may call for granulated sugar, brown sugar, molasses, coconut, tamarind paste and nuts. Vegetables may be included such as onions, carrots and cucumbers.

Adjustments to Chutney Recipes

Unless specified by the recipe no adjustments or additions of ingredients should be made to chutney recipes to avoid adversely affecting the safety of your canned product.

Tomatoes

Contrary to popular belief, tomatoes are not a high acid food. They are borderline high acid with a pH of approximately 4.5. This is too close to the dividing line between high and low acid foods. As a result, you must acidify homemade tomato products by adding bottled lemon juice, citric acid or vinegar before they are heat processed in a boiling water, steam or pressure canner. For this reason, it is important to use a recipe from a reputable source and to acidify your tomato products correctly, for all heat processing methods. *(See below for acidification instructions.)* Note that the maximum amount of processing time in a steam canner is 45 minutes.

Today's tomato hybrids are developed to be less acidic. This is especially true for Roma-type tomatoes, which are popular for sauces. Once you add other vegetables, such as peppers, onions, celery and herbs, the acidity is lowered even further. Therefore, one needs to either follow a tested recipe from a safe source, or pressure can tomato sauces. Boiling water and steam canning is only used for high acid foods. If your tomato products are not correctly processed your product could be unsafe for consumption. Mold, *E. coli*, or botulism are real food hazards if the product is not processed correctly.

There are some tomato products in the USDA canning procedures that only have a pressure process listed (for example, tomatoes with okra or zucchini, spaghetti meat sauces, Mexican tomato sauce, etc.). If a pressure canning process is the only listed option, then it is the required processing method; do use a boiling water or steam canner if not specifically listed as a process option. These products made according to the stated recipes and procedures are low-acid food mixtures.

Acidifying Tomatoes

Most of today's tomatoes have been bred for sweetness versus acidity. For this reason, additional acid must be added to canned tomatoes, tomato puree, tomato sauce and tomato juice in the form of either bottled lemon juice, citric acid or vinegar that has an acidity of at least 5%. Most recipes call for the acidity product to be added directly to each jar.

Acidification Chart	
Bottled Lemon Juice	1 Tablespoon per Pint 2 Tablespoons per Quart
Citric Acid	¼ Teaspoon per Pint ½ Teaspoon per Quart
Vinegar, 5% acidity	2 Tablespoons per Pint 4 Tablespoons per Quart

Choosing Tomatoes

Use the best quality, vine ripened tomatoes whenever possible. Green (unripe) tomatoes are more acidic than ripe tomatoes and can be canned safely by the boiling water method. Do NOT use tomatoes from dead or frost-killed vines as the tomatoes may be lower in acid.

Sort tomatoes, picking out any that are spoiled or green. Rinse with cool water. To peel tomatoes, dip tomatoes in boiling water long enough to crack the skins (about 1 minute). Cutting a shallow X in the blossom end of the tomato speeds this process. Dip in cold water. Peel and remove cores. Save any juice to add to the hot liquid in which you boil the tomatoes. If using frozen tomatoes, run them under warm water and slip the skins off.

Both round and oblong tomatoes are suitable for canning. Oblong (plum or paste) tomatoes are meatier and less juicy than round tomatoes and often preferred by home canners as they create thicker sauces in a shorter period of time. Tomatillos may also be canned in a boiling water or steam canner but must be acidified the same as tomatoes.

The following chart shows the approximate yield by tomato type and preparation method.

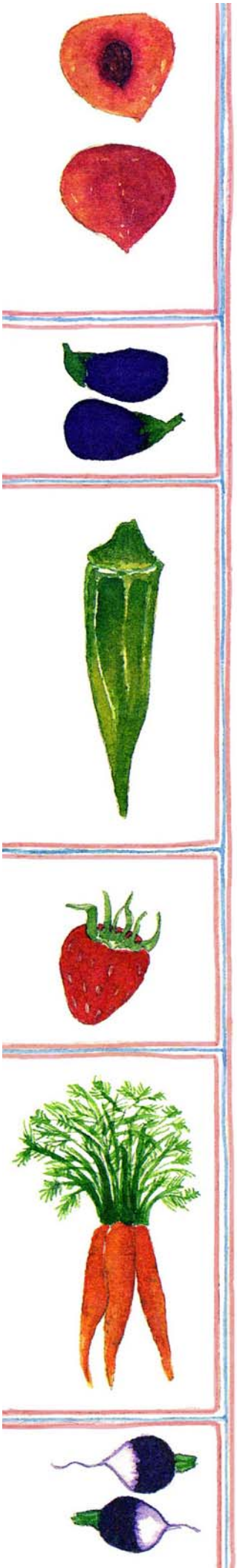
Tomato Type	Purchase Unit	Purchase Weight	Preparation	Yield (Volume)
Round or Globe	3 medium 3 medium	1 pound 1 pound	Chopped Peeled and crushed	2-1/2 to 3 cups 1-1/2 cups
Oblong, Plum or Paste (Roma)	5 medium 5 medium	1 pound 1 pound	Chopped Crushed or pureed	2 cups 1-1/2 cups

Tomatoes that work well for canning

Amish	Jersey Devil	Polish Linguisa	Saucy
Amos Coli	Juliet	Pozzano	Sausage
Big Mama Paste	Mama Leone	Principe Borghese	Ten Fingers of Naples
Black Prince	Martinos Roma	Roma	Tiren
Gilberti	Opalka	Russian Big Roma	Verona
Granadero	Paisano	Salvaterres	Viva Italia
Italian Gold (Yellow)	Plum Regal	San Marzano	

Canning Tomatoes

Water levels in canners: Many tomato recipes have long processing times. You can use a steam canner only if the maximum processing time (including altitude adjustments) is no more than 45 minutes. The canner may boil dry if you process jars for longer periods of time. If using a boiling water canner, start with 2-inches of water above the jars if the processing time is 30 minutes or longer, to allow room for the boiling water to evaporate but still leave at least 1-inch of water above the jars during the entire processing time.



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COLLEGE OF FAMILY AND CONSUMER SCIENCES
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Preserving Food: Flavored Vinegars

Vinegars garnished with sprigs of herbs or a layer of berries are a hot "splash" right now. They are favored by chefs for adding excitement to special dishes. Cooking at home is also enlivened by tantalizing tastes from the blending of flavors with vinegar. Flavored vinegars are easy and fairly safe to make at home, provided some simple precautions are followed.

Getting Ready

Jars and Bottles - Only glass containers are recommended for your flavored vinegars. Use glass jars or bottles that are free of cracks or nicks and can be sealed with corks, screw-band caps or two-piece canning lids. Wash containers thoroughly in warm, soapy water and rinse well. (A good bottle brush is a big help for narrow containers.) Then sterilize the clean, warm jars or bottles by completely immersing them in water and boiling for 10 minutes. Prepare the sterilizing bath before you wash the jars, or keep the clean jars in warm water until you are ready to put them in for sterilizing.

The best way to prevent breakage is to use a deep pot with a rack in the bottom, such as a boiling water canner. Fill the canner or pot at least half full with warm water. Place the empty, warm jars or bottles upright on the rack and make sure the water level is 1 to 2 inches above the tops of the jars. Bring the water bath to a boil, and continue boiling for 10 minutes. The jars should stay below the boiling water the entire time.

After 10 minutes of boiling, remove the jars or bottles from the water and invert on a clean towel. Use canning jar lifters or tongs that grab the containers without slipping. Fill the jars with your vinegar while they are still warm.

Lids and Caps - If using screw caps, wash in hot soapy water, rinse and scald in boiling water. (To scald, follow manufacturer's directions, or place caps in a saucepan of warm water, heat to just below boiling and then remove from the heat source. Leave caps in the hot water until ready to use.) Use non-corrodible metal or plastic screw caps. If using corks, select new, pre-sterilized corks. Use tongs to dip corks in and out of boiling water 3-4 times. Prepare two-piece metal home canning jar lids according to manufacturer's directions for canning. If using these lids, allow enough headspace between the lid and the vinegar so that there is no contact between them. Plastic storage screw caps that are made for canning jars are also now available and would work well for flavored vinegars.

Herbs - Allow 3 to 4 sprigs per pint (2 cups) of vinegar. Use very fresh herbs, picked before blossoming, for best flavor. It is best to pick fresh herbs soon after the morning dew has dried. Use only the best leaves or stems, discarding discolored, nibbled, crushed or dried out pieces. Wash the fresh herbs gently but thoroughly. Blot dry on clean paper towels. After herbs are washed and dried, dip them in a sanitizing bleach solution of 1 teaspoon of household chlorine beach in 6 cups of water. Rinse thoroughly under cold water and pat dry with clean paper towels.

Dried herbs may be substituted if necessary; allow 3 tablespoons dried herbs per pint of vinegar.

Fruits, Vegetables and Spices - Favorite fruits for flavoring vinegars are usually raspberries, blackberries, strawberries, peaches, pears and the peel of lemons and oranges. Sometimes they are combined with herbs or spices such as mint or cinnamon. Other popular flavorings include peeled garlic cloves, jalapeno or other peppers, green onions, peppercorns or mustard seed.

Thoroughly wash all fruits and vegetables with clean water; peel if necessary before use. Small fruits and vegetables may be left whole or halved. Larger ones, such as peaches, may need to be sliced or cubed. Allow 1 to 2 cups of fruit per pint of vinegar, or the peel of one orange or lemon per pint of vinegar. Garlic cloves, peppers and chunks of firm fruit may be threaded on clean, thin bamboo skewers for easy insertion and removal.

Vinegar - Several types of vinegar may be used, but not all give the same results. Distilled white vinegar is clear in color and has a sharp acidic taste by itself. It is the best choice for delicately flavored herbs. Apple cider vinegar has a milder taste than distilled white vinegar, but the amber color may not be desirable. Apple cider vinegar blends best with fruits. Wine and champagne vinegars are generally more expensive than distilled and cider vinegars, but are more delicate in flavor. White wine and champagne vinegars work well with delicate herbs and lighter-flavored fruits. Red wine vinegar would work well with spices and strong herbs like rosemary, but will mask the flavor of most herbs. Rice vinegar is a mild, slightly sweet vinegar used occasionally for flavoring. Be aware that wine and rice vinegars contain some protein that provides an excellent medium for bacterial growth, if not handled and stored properly. For added safety, use only commercially produced vinegars.

Flavoring the Vinegar

Place the prepared herbs, fruits and/or spices in the sterilized jars. Avoid overpacking the jars; use 3 to 4 sprigs of fresh herbs, 3 tablespoons of dried herbs, 1 to 2 cups of fruit or vegetables, or the peel of one lemon or orange per pint of vinegar to be flavored. If using basil, 1/2 cup of coarsely chopped leaves may also be used.

Often it is preferred to "lightly bruise" mint leaves or the sprigs of fresh herbs to release the flavors and shorten the flavoring process a little. If using dried bay leaves, leave whole for easy removal. A small slit may be cut in whole jalapeno peppers or peeled garlic cloves; wear plastic gloves when working with peppers.

Berries may also be "lightly bruised" as they are put in your container. When using orange or lemon peel, thinly cut off only the colored portion, avoiding the thick white underside. Try to cut the peel in a continuous or long spiral for easy removal later on.

Heat the vinegar to just below the boiling point, or at least 190-195° F. Pour over the flavoring ingredients in jars, leaving 1/4 inch headspace. Wipe rims of jars with a clean, damp cloth. Attach lids, corks or screw caps tightly. Let sit to cool undisturbed.

Store in a cool, dark place. Let sit undisturbed for 3 to 4 weeks to develop flavors.* Strain the vinegar through a damp cheesecloth or coffee filter one or more times until the vinegar shows no cloudiness. (Skewers of vegetables may be removed first.) Discard the fruit, vegetables and/or herbs.

Prepare jars and lids as before for final bottling steps. Pour the strained vinegar into clean sterilized jars and cap tightly. A few clean berries or a washed and sanitized sprig of fresh herb may be added to the jars before closing, if desired.

* A Note About Checking Flavors: It takes at least 10 days for most flavors to develop and about 3 to 4 weeks for the greatest flavor to be extracted. However, desired flavors are a matter of personal taste. Crushing, "bruising", or chopping fruits, herbs and vegetables before adding them to jars can shorten the flavoring process by about a week or so. To test for flavor development, place a few drops of the vinegar on plain white bread and taste. If the flavor has developed to a pleasing point for you, strain the vinegar and continue as above. If flavors seem too strong after the standing time and straining, dilute the flavored vinegar with more of the base vinegar that was used in preparing the recipe.

Storing the Vinegar

Store the flavored vinegars in a cool, dark place. Refrigeration is best for retention of freshness and flavors. Date the bottles or jars when they are opened. If properly prepared and bottled, flavored vinegars should keep for up to 3 months in cool storage. Fruit vinegars in particular may start to brown and change flavor noticeably after that. Refrigeration of all flavored vinegars may extend the quality for 6 to 8 months. Always keep vinegar bottles tightly sealed. After six months, even if there is no sign of spoilage, taste the vinegar before using to make sure the flavor is still good. If a flavored vinegar ever has mold on or in it, or signs of fermentation such as bubbling, cloudiness, or sliminess, throw it away without using any of the vinegar for any purpose.

Herbed and fruited vinegars are often displayed on sunny window sills and shelves as decorative room additions. If stored in this manner for more than a few weeks, these bottles should be considered as permanent decorations and not used in food preparation.

Significance of Safety Concerns

As long as clean and high-quality ingredients (vinegar and herbs, vegetables or fruits) are used, the greatest concern with homemade flavored vinegars should be mold or yeast and then having to throw out your product. If your flavored vinegar starts to mold at any time, or show signs of fermentation such as bubbling, cloudiness or sliminess, discard the product and do not use any of it that is left.

Some harmful bacteria may survive and even multiply slowly in some vinegars. It is important to follow directions carefully, store flavored vinegars in the refrigerator or cool places, and work in a very clean area with sanitary utensils. Also be sure hands are very clean while you work!

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Suggested Flavorings

Herbal-Mix Vinegar

For each pint jar of distilled white or wine vinegar to be flavored, make a bouquet from 3 sprigs each of fresh parsley, rosemary and thyme. Lightly crush before placing in jars.

Fresh Tarragon Vinegar

For each pint jar of distilled white or white wine vinegar to be flavored, use 3 (3 inch) sprigs of fresh tarragon, or 1 cup of fresh tarragon leaves and stems. Lightly crush before placing in jars.

Variation: Also add 1/3 cup minced fresh chives to each pint of vinegar, along with the tarragon.

Lemon-Dill-Peppercorn Vinegar

For each pint jar of distilled white vinegar to be flavored, use the spiral peel (colored part only) of 1 lemon, 4 sprigs of fresh dill, and 1/2 teaspoon whole black peppercorns. (This is especially good in marinades for fresh seafoods or salad dressings.)

Spicy Parsley Vinegar

For each pint jar of distilled white vinegar to be flavored, use 3 to 4 sprigs of fresh parsley, 1/2 teaspoon whole mustard seeds, and 1/2 teaspoon whole allspice.

Raspberry Vinegar

Wash 2 cups fresh raspberries gently but thoroughly. Bruise slightly with the back of a spoon or by rolling gently in waxed paper. Place in a sterilized quart glass canning jar. Heat 3 cups of vinegar to just below the boiling point and pour over the raspberries. Cap tightly and allow to stand 2 to 3 weeks in a cool, dark place. Strain vinegar through damp cheesecloth and discard fruit. Pour vinegar into clean, sterilized glass jars or bottles. Seal tightly. Store in the refrigerator for best quality and flavor. (This is especially good in dressings for mixed greens or fruit.)

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FDNS-E-1 07-00

Dehydrating

Dehydrating Fruit Basics

Drying Fruits Chart

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http://ucanr.edu/mfpcs

Dehydrating Fruits Basics

Dehydrating Foods

The overall objective in dehydrating foods is to remove moisture before the food spoils. To maintain safety and quality, consider several factors when drying fruits. Keep in mind that specific food products often have recommendations that are unique to them. Drying removes the moisture from food so that microorganisms such as bacteria, yeasts, and molds are less likely to grow; however, drying does not effectively destroy them. Because there is not a heat treatment that effectively destroys disease-causing microorganisms, it is critical to use safe food-handling practices when growing and handling fruits for drying.

- The optimum drying temperature is 140°F. If higher temperatures are used, the food will develop *case hardening* and moisture will not be able to escape from the food. This will lead to a moldy food product. Therefore, do not rush the drying process.
- Low humidity is also needed when drying foods. If the surrounding air is humid, the foods will not dry effectively. Increasing the air movement away from the food will assist in the drying process.
- Dry fruits in the oven (conventional or convection) or indoors using a dehydrator.

Additional Food Safety

When dehydrating foods, using good sanitary practices is critical to reducing the risk of contaminating foods with pathogens and spoilage microorganisms.

- After harvesting produce or herbs, place in containers and locations that are free from additional contamination (for example, where pets and wild animals will not have access).
- Begin the dehydration process soon after harvesting.
- Clean and sanitize all utensils, containers, the food-contact surfaces of dehydrating equipment and work surfaces.
- Always wash hands before handling foods—that includes harvesting.
- Consider using disposable gloves when preparing foods for dehydrating. Dispose of gloves after use.

Dehydrating Fruits

Pretreating fruits is a personal preference; food safety is not affected. Pretreating some fruits before drying will reduce vitamin loss, flavor loss, browning, and deterioration during storage.

- Ascorbic Acid is used by dissolving 1 tablespoon of the powder in 1 quart of cold water. Dip the fruit in the solution, drain, and dehydrate.
- Crazing: Some fruits have a protective wax coating, such as plums, figs, cranberries, blueberries, grapes, etc. It is necessary to pretreat these fruit by dipping them in boiling water for 1 to 2 minutes, according to the size and toughness of the skin.
- Sodium bisulfate is used by dissolving 2 teaspoons of the powder in 1quart of water and adding the cut fruit. Dip the fruit in the solution, drain, and dehydrate.
- Citric Acid is only one-eighth as effective as ascorbic acid. Dissolve 1 tablespoon in 1 quart of water. Dip the fruit in the solution, drain, and dehydrate.

- Citrus Juice: pineapple, lemon, and lime juice may be used, but are only one-sixth as effective as ascorbic acid. Use 1 cup of lemon or lime juice to 1 quart of water. Dip the fruit in the solution, drain, and dehydrate.
- Sulfuring means exposing fruit to fumes of burning sulfur. Some people are allergic to sulfur, especially those who suffer from asthma. Sulfuring must be done outside.

Testing for Dryness

- Fruit should be pliable and leather like, without any pockets of moisture.
- To test foods for dryness, remove a few pieces and let cool to room temperature. When warm or hot, fruits seem more soft, moist and pliable than they actually are. Squeeze a handful of the fruit. If no moisture is left on the hand and pieces spring apart when released, they are dry.

Finishing

Conditioning

All dried foods should be conditioned before packing to distribute the remaining moisture. Too much moisture left in a few pieces may cause the whole batch to mold. To condition fruit:

- Place dried foods in a tightly closed large container.
- Stir or shake each day for a week. This will equalize the moisture.
- If moisture forms on the inside of the container the food has not been dried sufficiently. Return the food to the dehydrator for a few more hours.
- Pasteurize any food products that could have been exposed to insect infestation or larva prior to handling or during the drying process by freezing it in airtight containers at 0°F for at least two days.

Storage

Moisture must be kept from dried foods when they are in storage.

- First, cool completely. Warm food causes sweating which could provide enough moisture for mold to grow.
- Pack foods into clean, dry insect-proof containers as tightly as possible without crushing. Store dried foods in clean, dry home canning jars, plastic freezer containers with tight-fitting lids or in plastic freezer bags. Vacuum packaging is also a good option.
- Pack foods in amounts that can be used in a recipe or all at once.
- Store containers in a dry, cool, dark location. Freezing is a good storage option.

Dried foods maintain the best quality and nutritional value if they are used in less than 12 months. With longer storage time they may not be as tasty or nutritious.

Using Dried Fruits

- To cook dried fruit, cover with boiling water and simmer covered until tender (about 15 minutes). If needed, sweeten to taste near the end of cooking or after removing from heat. Most dried fruits need no extra sweetening. If desired, add a few grains of salt to help bring out the fruit's natural sweetness, or add a little lemon, orange or grapefruit juice just before serving. This helps give fruits a fresh flavor and adds vitamin C.
- To reconstitute fruit for use in a cooked dish, such as a pie, place it in a bowl and cover with boiling water. Let soak until tender and liquid is absorbed (one hour or longer). Thinly sliced fruits may not require soaking before using in cooked dishes.
- Reconstituted or dried fruits are excellent in cobblers, breads, pies, puddings, gelatin salads, milk shakes and cooked cereals. Any liquid that remains after soaking can be used as part of the water needed in the recipe.

Resource: *National Center for Home Food Preservation, http://nchfp.uga.edu/*

Drying Fruits at Home

Fruit	Preparation	Pretreatment (Choose One)				Drying Times
			Blanch			
		Sulfur (hours)	Steam (minutes)	Syrup (minutes)	Other	Dehydrator* (hours)
Apples	Peel and core, cut into slices or rings about 1/8 inch thick.	3/4	3-5 min, depending on texture	10	-ascorbic acid mixture -ascorbic acid solution -fruit juice dip -sulfite dip	6-12
Apricots	Pit and halve. May slice if desired.	2	3-4	10	-ascorbic acid mixture -ascorbic acid solution -fruit juice dip -sulfite dip	24-36**
Bananas	Use solid yellow or slightly brown-flecked bananas. Avoid bruised or overripe bananas. Peel and slice 1/4-inch to 3/8-inch thick, crosswise or lengthwise.				-honey dip -ascorbic acid solution -ascorbic acid mixture -fruit juice dip -sulfite dip	8-10
Berries						
Firm	Wash and drain berries with waxy coating (blueberries, cranberries, currants, gooseberries, huckleberries).				-plunge into boiling water 15-30 seconds to "check" skins. Stop cooking action by placing fruit in ice water. Drain on paper towels.	24-36
Soft	Wash and drain. (boysenberries, strawberries)				-No pretreatment necessary.	
Cherries	Stem, wash, drain and pit fully ripe cherries. Cut in half, chop, or leave whole.			10 (for sour cherries)	-Whole: dip in boiling water 30 seconds or more to check skins. -Cut and pitted: No -Pretreatment necessary.	24-36
Citrus Peel	Peels of citron, grapefruit, kumquat, lime, lemon, tangelo and tangerine can be dried. Thick-skinned navel orange peel dries better than thin-skinned Valencia peel. Wash thoroughly. Remove outer 1/6 to 1/8 inch of peel. Avoid white bitter pith.				-No pretreatment necessary.	8-12
Figs	Select fully ripe fruit. Immature fruit may sour before drying. Wash or clean whole fruit with damp cloth. Leave small fruit whole, otherwise cut in half.	1 (whole)			-Whole: Dip in boiling water 30 seconds or more to check skins. Plunge in ice water to stop further cooking. Drain on paper towels.	6-12**
Grapes						
Seedless	Leave whole.				-Whole: Dip in boiling water 30 seconds or more to check skins. Plunge in ice water to stop further cooking. Drain on paper towels. -Halves: no pretreatment necessary.	12-20
With seeds	Cut in half and remove seeds.					

Drying Fruits at Home (continued)

Fruit	Preparation	Pretreatment (Choose One)				Drying Times
			Blanch			
		Sulfur (hours)	Steam (minutes)	Syrup (minutes)	Other	Dehydrator* (hours)
Nectarines and Peaches	When sulfering, pit and halve; if desired, remove skins. For steam and syrup blanching, leave whole, then pit and halve. May also be sliced or quartered.	2-3 (halves) 1 (slice)	8	10	-ascorbic acid solution -ascorbic acid mixture -fruit juice dip -sulfiting	36-48**
Pears	Cut in half and core. Peeling preferred. May also slice or quarter.	5 (halves) 2 (slices)	6 minutes (halves)	10	-ascorbic acid solution -ascorbic acid mixture -fruit juice dip -sulfiting	24-36**
Persimmons	Use firm fruit of long, soft varieties and fully ripe fruit of round drier varieties. Peel and slice using stainless steel knife.				-may syrup blanch	12-15**
Pineapple	Use fully ripe, fresh pineapple. Wash, peal and remove thorny eyes. Slice lengthwise and remove core. Cut in 1/2-inch slices, crosswise.				No pretreatment necessary	24-36
Plums (Prunes)	Leave whole or if sulfuring, halve the fruit.	1			-Sun drying: (whole) dip in boiling water 30 seconds or more to check skins. -Oven or dehydrator drying: rinse in hot tap water.	24-36**

* Because of variations in air circulation, drying times in conventional ovens could be up to twice as long. Drying times for sun drying could range from 2 to 6 days, depending on temperature and humidity.

** Drying times are shorter for slices and other cuts of fruit.

Drying Vegetables at Home

Vegetable	Preparation	Blanching Time Steam (minutes)	Blanching Time Water (minutes)	Drying Time Dehydrator* (hours)
Artichokes-Globe	Cut hearts into 1/8-inch strips. Heat in boiling solution of 3/4 cups water and 1 tablespoon lemon juice.		6-8	4-6
Asparagus	Wash thoroughly. Cut large tips in half.	4-5	3 1/2 - 4 1/2	4-6
Beans, green	Wash thoroughly. Cut in short pieces or lengthwise. (May freeze for 30 to 40 minutes after blanching for better texture.)	2-2 1/2	2	8-14
Beets	Cook as usual. Cool; peel. Cut into shoestring strips 1/8-inch thick.	Already cooked no further blanching required.		10-12
Broccoli	Trim, cut as for serving. Wash thoroughly. Quarter stalks lengthwise.	3-3 1/2	2	12-15
Brussels Sprouts	Cut in half lengthwise through stem.	6-7	4 1/2 - 5 1/2	12-18
Cabbage	Remove outer leaves; quarter and core. Cut into strips 1/8-inch thick.	2 1/2-3**	1 1/2-2	10-12
Carrots	Use only crisp, tender carrots. Wash thoroughly. Cut off roots and tops; preferably peel, cut in slices or strips 1/8-inch thick.	3-3 1/2	3 1/2	10-12
Cauliflower	Prepare as for serving.	4-5	3-4	12-15
Celery	Trim stalks. Wash stalks and leaves thoroughly. Slice stalks.	2	2	10-16
Corn, cut	Husk, trim and blanch until milk does not exude from kernel when cut. Cut the kernels from the cob after blanching.	2-2 1/2	1 1/2	6-10
Eggplant	Use the same directions as for summer squash	3 1/2	3	12-14
Garlic	Peel and finely chop garlic bulbs. No other pretreatment is needed. Odor is pungent.	No blanching is needed.		6-8
Greens (chard, kale, turnip, spinach)	Use only young tender leaves. Wash and trim very thoroughly.	2-2 1/2**	1 1/2	8-10
Horseradish	Wash; remove small rootlets and stubs. Peel or scrape roots. Grate.		none	4-10
Mushrooms (WARNING, see footnote***)	Scrub thoroughly. Discard any tough, woody stalks. Cut tender stalks into short sections. Do not peel small mushrooms or "buttons." Peel large mushrooms, slice.		none	8-10

Drying Vegetables at Home (continued)

Vegetable	Preparation	Blanching Time Steam (minutes)	Blanching Time Water (minutes)	Drying Time Dehydrator* (hours)
Okra	Wash, trim, slice crosswise in 1/8- to 1/4-inch disks.		none	8-10
Onions	Wash, remove outer "paper shells." Remove tops and root ends, slice 1/8- to 1/4-inch thick.		none	3-9
Parsley	Wash thoroughly. Separate clusters. Discard long or tough stems.		none	1-2
Peas, Green	Shell	3	2	8-10
Peppers, and Pimientos	Wash, stem, core. Remove "partitions." Cut into disks about 3/8 by 3/8 inch.		none	8-12
Potatoes	Wash, peel. Cut into shoestring strips 1/4-inch thick, or cut in slices 1/8-inch thick.	6-8	5-6	8-12
Pumpkin and Hubbard Squash	Cut or break into pieces. Remove seeds and cavity pulp. Cut into 1-inch wide strips. Peel rind. Cut strips crosswise into pieces about 1/8-inch thick.	2 1/2-3	1	10-16
Squash: Summer	Wash, trim, cut into 1/4-inch slices.	2 1/2-3	1 1/2	10-12
Tomatoes, for stewing	Steam or dip in boiling water to loosen skins. Chill in cold water. Peel. Cut into sections about 3/4-inch wide, or slice. Cut small pear or plum tomatoes in half.	3	1	10-18

* Drying times in a conventional oven could be up to twice as long, depending on air circulation.
** Steam until wilted.
*** WARNING: The toxins in poisonous varieties of mushrooms are not destroyed by drying or by cooking. Only an expert can differentiate between poisonous and edible varieties.

Rehydrating Dried Foods

Product	Water to Add to 1 Cup Dried Food (Cups)	Minimum Soaking Time (Hours)
Fruits*		
Apples	1 1/2	1/2
Pears	1 3/4	1 1/4
Peaches	2	1 1/4
Vegetables**		
Asparagus	2 1/4	1 1/2
Beans, lima	2 1/2	1 1/2
Beans, green snap	2 1/2	1
Beets	2 3/4	1 1/2
Carrots	2 1/4	1
Cabbage	3	1
Corn	2 1/4	1/2
Okra	3	1/2
Onions	2	3/4
Peas	2 1/2	1/2
Pumpkin	3	1
Squash	1 3/4	1
Spinach	1	1/2
Sweet Potatoes	1 1/2	1/2
Turnip Greens and other greens	1	3/4

* Fruits – Water is at room temperature.
** Vegetables – Boiling water used.

Freezing

Freezing Basics

Freezing Fruits Guide

UCCE Master Food Preservers of Central Sierra
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http://ucanr.edu/mfpcs

Freezing Fruits Basics

Basic Food Safety

Wash Hands Frequently

- Personal cleanliness is a must. Wash your hands thoroughly and frequently. E. coli resides in the human nose and intestines. Wash your hands if you rub your nose, or if you wipe your face or skin.
- Bandage any cuts or burns on hands before handling food, or use disposable gloves.

Avoid Cross Contamination

- Rinse all fresh fruits and vegetables well under running water before preparing or eating them. Dry them with a clean cloth or paper towel.
- **ALWAYS** wash your hands, knives, cutting boards, and food preparation surfaces well with soapy water before and after any contact with raw meat, fish, or poultry.
- Use a disinfecting solution of 1½ teaspoon of chlorine bleach to 1 pint of water. Dispense with a spray bottle to disinfect countertops, cutting surfaces, sinks, etc. Make a new solution daily.

When In Doubt, Throw It Out

- Never taste food that looks or smells strange to see if it can still be used.
- Most bacteria that cause foodborne illness are odorless, colorless, and tasteless.

Freezing Foods

Retains natural color, flavor and nutritive value of foods and is quick and simple to do. Freezing slows down the enzymes in fruits and vegetables that cause them to ripen and then decay.

Freezing Pointers

- Freeze foods at 0°F or lower. For rapid freezing, set the temperature to -10°F 24 hours in advance.
- Freeze foods as soon as they are packed and sealed.
- Water in food freezes and expands creating ice crystals, which rupture cell walls of fruits and vegetables, making them softer when thawed. Large ice crystals do more damage to food cells and cause softer, mushier textures. Minimize the size of ice crystals by keeping the temperature consistent and freezing the food quickly.
- Do not overload your freezer with unfrozen food. Add only the amount that will freeze within 24 hours, which is usually 2 to 3 pounds of food per cubic foot of storage space. Overloading slows down the freezing rate, and foods that freeze too slowly may lose quality.
- Place packages in contact with refrigerated surfaces in the coldest part of the freezer.
- Leave a little space between new packages so air can circulate freely. Stack after frozen.

Preparing Fruits for Freezing

Select premium fruits that are fully ripe and free of bruises and other blemishes. Carefully wash, dry, remove pits, and peel, if desired. Use one of the methods described below to prepare fruit for freezing.

Strength of Syrup	Water (cups)	Sugar (cups)	Yield (cups)
Light	4	1	4 ¾
Medium	4	1 ¾	5
Heavy	4	2 ¾	5 ½

Without sugar

- Fruit may be frozen without sugar in a water pack or sugar-free fruit juice, such as citrus or berry juice.
- Small fruit such as berries, cherries, and grapes may be frozen in a single layer on a cookie sheet before packing in containers.

Syrup pack

- Fruit may be frozen in a simple syrup of water and cane or beet sugar.
- Dissolve sugar in hot water and cool before using.
- If desired, part of the sugar may be replaced by corn syrup or honey.
- Allow about 2/3 cup of simple syrup for each pint of fruit; 1⅓ cup for each quart of fruit.

Sugar pack

- Juicy fruits and those that will be used for pies or other cooked products may be packed in sugar.
- Use about 1 cup of sugar for each 2 to 3 pounds of fruit.
- Gently mix until the sugar has dissolved in the fruit's juices.

Retarding browning

- Ascorbic acid may be used to reduce browning of light-colored fruit.
- For syrup or liquid packs, add ½ teaspoon ascorbic acid to each quart of cold syrup.
- For sugar or sugarless dry packs, dissolve ½ teaspoon ascorbic acid in 3 tablespoons cold water and sprinkle over 4 cups of fruit just before adding sugar.

Packaging and Shelf Life

Packaging and Labeling Foods

- Cool all foods and syrup before packaging to speed up freezing and help retain the natural color, flavor and texture of food. (Cool in shallow containers in the refrigerator or ice bath.)
- Pack foods in single meal quantities.
- Follow directions for each individual food (see page X) to determine which can be packed dry and which need added liquid. Some loose foods such as blueberries may be individually tray packed.
- Pack foods tightly leaving as little air as possible in the package.
- Most foods require headspace between the packed food and closure to allow for expansion of the food as it freezes. Fruits that are exceptions and do not need headspace include tray packed foods.
- Seal rigid containers carefully. Use a tight lid and keep the sealing edge free from moisture or food to ensure a good closure. Secure loose-fitting covers with freezer tape.
- Label each package, including the name of the product, any added ingredients, packaging date, the number of servings and amount of each serving, and the form of the food, such as whole, sliced, etc. Use freezer tape, marking pens or crayons, or gummed labels made especially for freezer use.

***Containers*:** Use proper packaging materials to protect food's flavor, color, moisture content and nutritive value from the dry climate of the freezer. The type of containers depends on the type of food to be frozen, personal preference and what you have at home. Do not freeze fruits in containers with a capacity over one-half gallon. Foods in large containers freeze too slowly to result in a satisfactory product.

Best packaging materials:

- Moisture vapor resistant
- Not become brittle and crack at low temperatures
- Resistant to oil, grease or water
- Protect foods from absorption of off flavors or odors
- Durable and leak proof
- Easy to seal and mark

Rigid: Used with liquids or soft foods

- Plastic
- Glass: wide mouth dual purpose jars
- Straight sides (no shoulder)
- Tight fitting covers/freezer tape

Flexible: Used with irregular shapes and liquids

- Flexible freezer bags
- Plastic freezer wrap
- Freezer paper
- Heavy-weight aluminum foil

Headspace to Allow Between Packed Food and Closure Table

Type of Pack	Container with wide top opening		Container with narrow top opening	
	Pint	**Quart**	**Pint**	**Quart**
Liquid Pack*	½ inch	1 inch	¾ inch	1 ½ inch
Dry Pack**	½ inch	½ inch	½ inch	½ inch
Juices	½ inch	1 inch	1½ inch	1½ inch

*Fruit packed in juice, sugar, syrup or water; crushed or pureéd fruit.
**Fruit or vegetable packed without added sugar or liquid.

Freezer Shelf Life

- Freezing cannot improve the flavor or texture of any food, but when properly done it can preserve most of the quality of the fresh product. Knowing how long a particular food can be stored in the freezer is not as simple as it sounds.
- With proper packaging, frozen fruits will last 8-12 months of storage at 0°F. The storage time assumes the fruit has been prepared and packaged correctly and stored in the freezer at or below 0°F. For best quality use the shorter storage times. After these times, the food should still be safe, just lower in quality.

Refreezing Frozen Foods

Occasionally a home freezer stops running. The time the food will stay frozen depends on the amount of food in the freezer and the temperature of the food. A full load of food will stay for up to 2 days if the freezer is not opened. It is safe to refreeze fruits that still have ice crystals in them. If the temperature has warmed above 40°F, foods may not be fit for refreezing.

Freezing Fruits Guide

Apples	Select crisp, firm fruit. To prevent browning during preparation, pretreat. Drain and pack in syrup, pack in sugar, or pack without sugar.
Applesauce	Wash apples, peel if desired, core and slice. Pretreat if desired. Cook until tender in water (1/3 cup to each quart of slices). Cool and strain if necessary. Sweeten to taste.
Apricots	Select firm, ripe, uniformly yellow fruit. Wash, halve, and pit. Pretreat to retard browning if desired. Peel and slice if desired. (to loosen skins, dip in boiling water for 15 to 20 seconds.) Pack in syrup or sugar.
Avocados	Best frozen as puree (not whole or sliced). Select avocados that are soft with rinds free from dark blemishes. Peel, halve, and remove pit. Mash the pulp. Pack in sugar (1cup to 1 quart of puree) if using for ice cream or milk shakes or pack without sugar if using for salads, dips, or sandwiches.
Bananas	Select firm, ripe bananas. Peel and mash thoroughly. Add ½ teaspoon ascorbic acid per cup.
Blackberries	**Also boysenberries, loganberries**. Select firm, fully ripe fruit with glossy skins. Wash and drain. Pack in syrup, sugar, or without sugar.
Blueberries	**Also huckleberries**. Select ripe berries with tender skins. Wash and drain. If desired, steam for 1 minute and cool immediately to tenderize skin. Pack in syrup or sugar.
Cantaloupe	**Also other melons**. Select firm, well colored, ripe melons. Cut in half, remove seeds and peel. Cut into slices, cubes, or balls. Pack in syrup.
Cherries, sour	Select bright red, tree-ripened fruit. Stem and wash. Drain and pit. Pack in syrup, sugar, or without sugar.
Cherries, sweet	Select tree-ripened red varieties. Stem and wash. Remove pits if desired. Pretreat if desired. Pack in syrup or without sugar.
Currants	Select fully ripe, bright red fruit. Wash and stem. Pack in syrup, sugar or without sugar.
Figs	Select tree-ripened, soft-ripe fruit. Wash and cut off stem. Peel if desired. Slice or leave whole. Pack in syrup, sugar, or without sugar
Grapefruit	**Also oranges**. Select firm tree-ripened fruit, heavy for its size and free of soft spots. Divide fruit into sections, removing all membranes and seeds. Pack in syrup (made with excess juice, add water if needed) or water without sugar.
Peaches	**Also nectarines**. Select firm, fully ripe, well-colored fruit. Wash and pit. Peel if desired. Cut in halves or slices. Pack in syrup, orange juice, or water without sugar. Pretreat to retard browning
Pears	Select well-ripened, firm fruit. Wash and peel. Cut in halves or quarters and remove cores. Pretreat if desired. Heat in boiling syrup for 1 to 2 minutes (depending on size). Drain, cool, and pack in syrup.
Persimmons	Select orange, soft-ripe fruit. Sort, wash, peel, and cut into sections. Press fruit through a sieve to make a puree. To each quart of puree, add 1/8 teaspoon ascorbic acid. May be packed with or without sugar.
Plums	Select firm, tree-ripened fruit. Wash. Cut in halves, quarters, or leave whole. Pretreat if desired. Pack in syrup or pack without sugar.
Raspberries	Select fully ripe, juicy berries. Wash and drain. Pack in syrup, pack in sugar, or pack without sugar.
Rhubarb	Select firm, well colored stalks. Wash and cut into 1" to 2" pieces. Pack in syrup or without sugar**.**
Strawberries	Select firm, ripe red berries. Wash, drain, and remove hulls. Slice if desired. Pack in syrup or pack without sugar

*Fruits may be frozen as purees for use later in jam making. Ascorbic acid may be used to prevent darkening and increase the vitamin C content.

Resources

- National Center for Home Food Preservation [Internet]. University of Georgia [cited 2014 September 4]. Available from: http://nchfp.uga.edu/
- Drying Fruits and Vegetables [Internet]. Oregon State University [cited 2014 September 4]. Available from: http://extension.oregonstate.edu/fch/sites/default/files/documents/pnw_214_freezingfruitsandvegetables.pdf