LET'S PRESERVE

Ingredients Used in Home Food Preservation

The quality and safety of home-preserved foods is dependent, in large part, on the ingredients that are used. Selecting the highest quality fruits and vegetables at their peak of freshness is the first step. Those that show signs of decay or are heavily bruised should be avoided. It is important to follow preservation recipes using the ingredients as written. Do not make changes to ingredient amounts or ratios that affect acidity and texture, as these factors play an important role in the safety of the process. Minor changes can be made only where the recipe allows. This guide provides information on many of the typical ingredients used in home food preservation recipes.

Water

Water accounts for over 90 percent of most foods. When water is a recipe ingredient, its composition can determine the quality of the final product. For safety reasons, use only water that you know is safe to drink. The quality of canned foods can be affected by the amount of minerals in water. If hard water is used, high levels of calcium or magnesium can lead to the formation of white precipitate that clouds the brine and eventually settles to the bottom of the jar. This phenomenon is especially true for low-acid foods, such as canned green beans. Other minerals, such as iron, can darken light-colored foods or add an unpleasant flavor. If minerals in hard water are a problem, consider using filtered bottled water or passing water through one of the commercially available water treatment units that attach to the faucet.

Salt and Salt Substitutes

Generally, salt is added to foods to enhance their flavor. Salt can be omitted for canning tomatoes, vegetables, meats, poultry, and seafood since the amount added does not contribute to the safety of the food. However, in fermented sauerkraut and brined pickles, salt not only provides a characteristic flavor but also is vital to safety since it favors the growth of desirable bacteria while inhibiting the growth of others. Therefore, do not attempt to make sauerkraut or fermented pickles by cutting back on the salt required.

Table salt is safe to use for canning. However, it usually contains anticaking additives that may make the brine cloudy or produce sediment at the bottom of the jar. Iodized salt is not recommended for fermenting pickles and sauerkraut, or for canning, because it may cause them to darken, discolor, or be spotty. It will also cause unusual colors to form in some vegetables. For example, cauliflower will sometimes turn pink or purple.

Photo credit: Mike Houtz, Penn State

Canning salt or pickling salt is pure salt, no additives. This type of salt is the best choice for canning, pickling, and sauerkraut.

Kosher salt is a coarse, flaked, pure salt that also can be used in canning. Since flaked salt may vary in density, it is not recommended for making pickled and fermented foods, especially when salt concentration is a critical factor for microbial growth.

Sea salt is evaporated sea water and contains various minerals. It is safe to eat, but minerals in the salt may cause canned foods to discolor or affect the flavor.

Rock salt, ice cream salt, and solar salt are used to melt ice, freeze homemade ice cream, and soften water. Since they are not considered suitable for human consumption, do not use them for home food preservation.

Salt substitutes contain chemicals that provide a salty flavor but little or no sodium. Most salt substitutes contain potassium chloride. Some people think the potassium chloride has a metallic taste. One brand adds L-lysine to mask the metallic flavor. Do not substitute potassium chloride for sodium chloride in fermentation recipes. One way to lower the sodium content of sauerkraut or pickles is to rinse the product with water just before heating and serving, but never do this before canning. Lowering the salt content of fermented products before canning will lower the acid content (raise the pH) and possibly render the product unsafe to eat or quick to spoil.

PennState Extension

Sugars and Nonnutritive Sweeteners

Understanding the flavor and heat stability properties of different sweeteners is important when deciding which to use for a specific application. For best results, we recommend following canning and freezing recipes in the Let's Preserve series or those from the National Center for Home Food Preservation. These recipes have been pretested to make sure that you get good results consistently.

Table sugar (sucrose) is the typical white granulated product we use to sweeten foods. Brown sugar is refined white sugar with molasses mixed in, and although the flavor differs somewhat, it has about the same sweetness value as white sugar when considered on a volume basis. Powdered sugar is finely ground sucrose combined with a small amount of cornstarch to prevent caking. This starch makes it unsuitable for canning because it may cause the brine to become cloudy. In addition to its sweetening effect, sugar serves as a preserving agent and aids in the gelling of jams and jellies.

Corn syrup is manufactured from corn starch by heating under acidic conditions. After a concentration step, the final product is a viscous mixture consisting mostly of glucose and polysaccharide chains of varying lengths. There are various corn syrups available on the market; the sugar content may vary depending on how long the process is allowed to proceed. Therefore, it is difficult to convert a volume of sugar into an equivalent amount of corn syrup at the same sweetness level. We recommend using a pretested food preservation recipe that specifically indicates how much liquid corn syrup to use.

High-fructose corn syrup (HFCS) is corn syrup that has been modified enzymatically to convert glucose molecules into fructose. The sweetening ability of the HFCS can be manipulated by adjusting the amount of fructose to between 42 and 90 percent of the product. HFCS is used most often as an ingredient in commercially manufactured foods and typically not found on grocery store shelves. If you were to find and use HFCS, consider using a lower volume than in recipes calling for corn syrup.

Honey is a natural product in which the primary sugar is fructose. It is safe to use as sweetener for canning or freezing. However, the flavor of the honey-sweetened foods may be noticeably different than expected. You may wish to make small quantities first to determine if you like them.

Photo credit: Mike Houtz, Penn State

Maple syrup is made from the sap of sugar maple trees. The extracted liquid is concentrated by boiling to reach a standard sugar content of 66 percent. Pure maple syrup has a strong smoky flavor that some find too intense. Therefore, maple syrup products found in the grocery store usually contain added corn syrup sweeteners to moderate the flavor and reduce costs. As recommended previously, experiment with small batches to determine if the characteristic maple syrup flavor is compatible with your product.

Agave syrup, also known as agave nectar, is produced from the fibrous core of the agave plant. The juice within the core is extracted by a hot water process and then further treated with a combination of enzymes and high temperature conditions to break down flavorless inulin starch into soluble sugars. The treated extract is then concentrated into a syrup by boiling or a vacuum evaporation process. Because most of the sugar contained in agave syrup is fructose, its sweetening properties are similar to those of high-fructose corn syrup. Agave syrup has a unique flavor and some experimentation may be required when adapting recipes that originally call for sugar or corn syrup.

Sucralose is a chemically modified form of sucrose with no nutritive value (0 calories); the bulking agents added do contribute some energy value and the product contains about 12 percent of the calories of an equal volume of table sugar. Splenda® is a commercially formulated mixture of sucralose, starch, and dextrose sugar. Unlike other nonnutritive sugar substitutes, Splenda® is heat stable, so it can be used in canned foods. Some people do notice an aftertaste that may increase with storage time. Although Splenda® will provide sweetness, it will not provide the firmness to canned fruits that sugar does. Products canned with Splenda® will therefore be similar in texture to those canned in water. The Splenda® website (**splenda .com**) has recipes for preparing shelf-stable jams and jellies.

Stevia is stable to heat and could be used for canning fruit and other products in which sugar is not critical to food safety or texture. Rebaudioside A, the active ingredient in stevia, is 300 times sweeter than sugar. It has been listed as "generally recognized as safe" by the Food and Drug Administration (FDA) and therefore is exempt from food additive regulations. Truvía® is a stevia-based sugar substitute currently available on the market. According to their website (**truvia.com**), the product can be used for baking, cooking, and jam making. Splenda also has a stevia-based sweetener called Splenda Naturals. We have no reliable information on its potential use in canning and/or freezing. Green stevia leaves or leaf powders are available, but their sweetening effects might not be consistent.

Aspartame is not recommended as a sweetening ingredient in canned foods because it rapidly breaks down into flavorless products during heating and storage. However, it can be added to sugarless processed fruits to sweeten them just prior to eating. Aspartame also can be used successfully in frozen fruit recipes.

Saccharin is a more heat-stable synthetic sweetener that can be used for jellies and jams, although some users have noticed a bitter taste after processing. Saccharin is also suitable for freezing.

Acidulants

Acids naturally present in or added to foods are an important part of the preservation process. Never change the amount of acid, dilute the acid with water, or substitute acid sources unless the recipe specifically allows you to do so.

Vinegar is obtained naturally by sequential fermentation of sugar to alcohol and then to acetic acid. Cider vinegar is derived from apple juice, while white vinegar is made from pure grain alcohol. For home food preservation purposes, use vinegars that are labeled as 5 percent acidity (50 grain) and that are pasteurized since they produce consistent results. White vinegar is usually preferred when light color is desirable, as is the case with fruits and cauliflower. Do not use homemade vinegar or vinegar of unknown acidity in pickling. It is important to follow the proper proportion/ratio of vinegar, water, and vegetables given in the recipe. Do not dilute the vinegar unless the recipe says to do so since you will be diluting the preservative effect. If a less sour product is preferred, add sugar rather than decrease the vinegar. Overfilling jars with vegetables or underfilling them with acid brine will lower the total acidity of the product and may adversely affect the safety of the product.

Lemon juice is another natural acidulant commonly used in home food preservation. To ensure safe acidity in whole, crushed, or juiced tomatoes, add 2 tablespoons of lemon juice per quart of tomatoes or 1 tablespoon per pint. Fresh-squeezed lemon juice can contain varying amounts of acid. To ensure consistently safe results, use bottled lemon juice purchased at the supermarket. An alternative to lemon juice for acidifying tomatoes is citric acid.

Citric acid is usually sold as a white crystalline powder. It can be used safely to acidify foods if used correctly. To acidify the canned tomatoes described above, citric acid may be used instead of lemon juice. Add ½ teaspoon per quart or ¼ teaspoon per pint. Citric acid also is used to preserve the color of fresh cut fruit or as a pretreatment for frozen and dried fruit (see Color Enhancers and Colorants section).

Photo credit: Mike Houtz, Penn State

Aspirin, also known as acetylsalicylic acid, should never be used to acidify foods. Some people have a bad reaction to aspirin and its acidification properties vary depending on its strength.

Color Enhancers and Colorants

Citric acid is used to preserve the color of fresh cut fruit or as a pretreatment for frozen and dried fruit. It can be used either alone or mixed with other substances, such as ascorbic acid, erythorbic acid, N-acetylcysteine, glutathione, and EDTA. Most people find it more convenient to use commercially prepared antioxidant formulations such as Fresh Fruit Preserver, which contain a mixture of citric and ascorbic acids as active ingredients.

Ascorbic acid, also known as vitamin C, is used as an antioxidant to keep fruit from darkening. Pure crystals may be obtained at supermarkets and drug stores. Soak fruit immediately after cutting for 10 minutes in a solution prepared with 1 teaspoon of pure ascorbic acid dissolved in 1 gallon of cold water. Crushed vitamin C tablets also can be used. Six 500-milligram tablets equal 1 teaspoon of ascorbic acid. Erythorbic acid, also known as isoascorbic acid, is chemically identical to ascorbic acid but has no vitamin C activity because it is structurally different. It does have similar antioxidant properties and can be used the same way ascorbic acid is used to retain color.

Sulfites are sulfur-containing compounds that have been used for centuries to prevent discoloration and reduce spoilage during the preparation, dehydration, storage, and distribution of many foods. However, in recent years, sulfites have been implicated as initiators of asthmatic reactions in some people. As a result, the FDA has banned the use of sulfites on fresh fruits and vegetables for sale or served raw to consumers. They are still used as an antimicrobial agent and to help preserve the color of some dried fruit products. However, because of the health considerations involved, we recommend against the use of sulfites to preserve foods.

Food colors are available in both synthetic and natural forms. Although not necessary if good quality ingredients are used, there are several food-grade food dyes available that are safe to use. For example, artificial red food coloring is an optional ingredient for canned cherry pie filling. Make sure any colorants you use are approved by the FDA for use in foods and use them according to label directions. Avoid certain colorants that some people have reported being sensitive to, such as yellow #5 or carmine red. Some highly colored fruits or vegetables can act as a natural color sources—for example, beet juice, which is used to impart a red color to refrigerated pickled eggs, or turmeric powder, which is used in pickle recipes to add a yellow color.

Texture Enhancers and Thickening Agents

Pickling lime (calcium hydroxide) is a safe product that, if used correctly, can be used to improve the texture of pickles. But it is not necessary if good quality ingredients are used. Food-grade

lime is used as a lime-water solution for soaking fresh cucumbers 12 to 24 hours before pickling. Excess lime absorbed by the cucumbers must be removed to make safe pickles. After soaking, drain the lime-water solution, rinse, and then resoak the cucumbers in fresh water for 1 hour. Repeat the rinsing and soaking steps two more times before processing.

Calcium chloride is commercially available in food-grade products as Pickle Crisp® from Ball and Xtra Crunch® from Mrs. Wages. It provides the calcium necessary to help firm pectin but does not have the hydroxide component of pickling lime that can lower the acidity of pickled foods. Follow the manufacturer's directions. Do not use calcium chloride products that are not specifically labeled as food grade since they may contain other chemicals that are not safe to eat.

Alum, sold as a pickling ingredient, may be used safely to make fermented cucumbers crispier. But it is unnecessary if good-quality cucumbers are used and tested recipes are followed. Alum does not improve the firmness of quick-process pickles.

Starches are a common group of thickeners used in many food products. Since the viscosity (thickness) of food during canning affects the amount of heat that penetrates into jars during processing, use only the exact type and amount of starch specified in the recipe. Do not modify recipes for soups by adding starch thickeners since this may result in underprocessing.

- ClearJel® is recommended in the *USDA Complete Guide to Home Canning* for canning pie fillings because it remains thin during processing to allow heat to penetrate into the jar and then thickens upon cooling. It also does not break down at high temperatures, which would result in a runny consistency of the final product. However, ClearJel® is not recommended for frozen sauces since it tends to weep during thawing.
- Instant ClearJel® thickens without cooking and thus is not suitable for canned pie fillings. However, because it is freeze/thaw stable, it is a good option for preparing a pie filling just before pouring on top of a crust and then freezing.
- Thermflo® is an acceptable alternative for canning since it is also stable during heating and exhibits about the same viscosity as ClearJel® during heating. Thermflo® has the added advantage of holding up well during freeze/thawing.
- Tapioca is another option for thickening fresh and frozen pie fillings. The small tapioca granules do not dissolve completely when cooked, so pies thickened with tapioca appear to contain tiny gelatin-like balls. Instant tapioca or tapioca starch eliminates this effect because the starch is finely ground. Tapioca starch thickens at a lower temperature and stays stable when frozen. To use in a pie filling when mixed with the other ingredients, let it sit for 5 minutes to soak up some of the liquid. Tapioca is not recommended for canning pie fillings or other canned foods.

Pectins are naturally occurring thickening agents extracted from the cell walls of certain fruits. When the correct proportion of acid, sugar, and water is heated and then allowed to cool, a thickened gel forms. Apples, crab apples, gooseberries, and some plums and grapes usually contain enough natural pectin to form a gel. Other fruits, such as strawberries, cherries, and blueberries, contain little pectin and must be combined with other fruits high in pectin or commercial pectin extracts. Modified pectins are specifically manufactured to make low-sugar, no-sugar, and freezer jams and jellies. To obtain the best results, follow the instructions provided exactly as provided by the manufacturer.

Gelatin is an animal protein that forms a gel under refrigerated conditions. Gelatin is not heat stable and therefore not appropriate for canned foods. However, it may be used to thicken refrigerated low-sugar jams and jelly recipes.

Miscellaneous Ingredients

Oils are pressed from several types of plants including corn, sunflower, safflower, canola, olives, walnuts, and hazelnuts. A few teaspoons of aromatic oils may be added to canning recipes with no effect on the safety of the process. However, adding more than the recommended amount to an already approved recipe may be hazardous since penetration of heat into the product may be affected.

Spices and herbs are aromatic dried leaves or other plant parts used to flavor food. Because of their intense flavor, dried spices and herbs are used in small amounts that do not affect the safety of recipes. Premixed spice mixes are available for specific products, such as salsa or pickled vegetables, and safe to use if package instructions are followed. Because the drying process concentrates flavors in dried herbs, you will need about three times the amount of fresh herbs when substituting for dry. A few sprigs of fresh herbs can also be added to canning recipes with no effect on the safety of the process. However, if a fresh herb is the main ingredient of the product, such as for basil pesto, it must be processed as a low-acid food. We do not have any tested recipes for canning pesto sauces and we encourage people to freeze this product instead.

Water glass, chemically known as sodium silicate, has long been used to preserve eggs. We cannot recommend the use of water glass since the safety of products preserved using this ingredient has not been evaluated scientifically.

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