



preserve it right

Canning fruits

Organisms that cause food spoilage—molds, yeasts, and bacteria—are always present in the air, water, and soil. Enzymes that can cause undesirable changes in flavor, color, and texture are naturally present in raw fruits. Canning destroys the organisms that cause spoilage and also inactivates the enzymes. Because fruits are high in acid they can be safely processed in either a boiling water canner or a pressure canner. The open kettle method is unsafe because undesirable microorganisms can still grow after food is heated in this manner.

Select and prepare fruit

Choose fresh, firm, high quality fruit. Wash all fruits thoroughly under running water or through several changes of water. Lift the food out of the water each time so dirt that has been washed off will not settle back on the food. Rinse pan or sink between washings. Do not let fruits soak; they may lose flavor and nutritive value. Handle fruit gently to avoid bruising. Avoid exposing prepared fruit to air; process it as soon as possible.

The number of quarts of canned food from a given amount of fresh fruit depends on the quality, condition, variety, maturity, and size of the fruit, the size of pieces packed, and whether the fruit is packed hot or raw.

Generally, the following amounts of fresh fruit (as purchased or picked) yield 1 quart when canned:

	Pounds
Apples	2 to 3
Apricots	2
Berries	1 to 3
Cherries	2 to 3
Grapefruit, oranges	2
Peaches, nectarines	2 to 3
Pears	2 to 3
Plums	1 to 2

Light colored fruits—especially apples, apricots, pears, and peaches—darken when cut and exposed to air. This harmless browning reaction can be prevented by pretreating the fruit with an ascorbic acid solution. Keep fruit in this solution until it is ready for packing. Be sure to drain fruit well before placing in jars. Ascorbic acid is available in several forms:

- Pure, powdered ascorbic acid is available among canning supplies in supermarkets. Use 1 teaspoon per gallon of water.
- Vitamin C tablets are economical and widely available. Buy 500-milligram tablets; crush and dissolve six tablets (3,000 milligrams) per gallon of water.
- Commercially prepared mixes of ascorbic and citric acid are available among canning supplies in supermarkets. Follow package directions.
- Citric acid powder can be used but is less effective in preventing discoloration.

Use standard jars and lids

Use only jars and two-piece lids made especially for canning. Check for defects that could cause sealing failures, such as cracks or chips in jars and dents or rust on lids. Commercial jars such as those for mayonnaise are not recommended for home canning because they are not designed for use with two-piece lids and because the glass is more likely to break during processing. Wash jars in hot soapy water; rinse well. Prepare lids and bands according to manufacturer's directions.

Mineral deposits or hard water film on jars can be removed by soaking the empty jars in a solution of 1 cup vinegar per gallon of water. To avoid mineral deposits on jars during processing, add $\frac{1}{4}$ cup vinegar per gallon of water used in the canner.

Sterilize jars if necessary

Foods processed less than 10 minutes must be packed in sterile (as opposed to clean) jars. To sterilize empty jars, put them right side up on the rack in a boiling water canner. Fill canner and jars with hot (not boiling) water to 1 inch above the tops of the jars. Boil 10 minutes if you are canning at altitudes below 1,000 feet. Boil 11 minutes for elevations between 1,000 and 2,000 feet (see map on page 3).

Remove and drain hot sterilized jars one at a time. Save the hot water for processing filled jars.

Select style of pack

Raw or hot pack?

Fruit is canned in either raw or preheated form with added liquid—water, sugar syrup, or fruit juice (sweetened or unsweetened, extracted or commercially prepared). See Table 2 for directions for specific fruits.

Sweetened or unsweetened?

Sugar syrup will help fruit retain its shape, color, and flavor but adds calories and is not necessary for preservation. Processing times are the same whether fruit is sweetened or unsweetened.

Sugar substitutes like saccharin and aspartame do not help retain color or texture in home-preserved fruits.

Saccharin may produce an unwanted aftertaste. Aspartame, sold under the brand name Equal, loses its sweetness at high temperatures, and so is not suitable for canning. Fruit can be packed with water and sweetened with a non-nutritive sweetener prior to serving if desired.

Fruit juices, such as apple, pineapple, pear, or white grape juice, are compatible with many fruits. They can be used for the canning liquid as is or diluted with water.

Fill jars

Put raw or heated fruit in jars, adding syrup, water, or juice to cover. Fruit at the top of the container will darken if not covered with liquid. Plan on ½ to 1½ cups liquid per quart jar.

The space between the packed food and liquid and the top of the jar is called headspace. Use the specific amount of headspace given with the directions for canning each fruit as shown in Table 2.

Slide a non-metallic spatula between the food and the side of the jar to remove any air bubbles. Wipe jar rims with a clean, damp cloth to remove any particles that might interfere with sealing. Adjust lids.

Use a very light, light, medium, or heavy syrup to suit the sweetness of the fruit and your taste. Fruit canned in very light syrup is the most economical and adds the fewest calories.

To make sugar syrup

Mix sugar with water or with juice extracted from some of the fruit. To extract juice, crush ripe, juicy fruit thoroughly. Heat to simmering (185°F to 200°F) over low heat. Strain through cloth bag or cloth-lined strainer, or paper coffee filters.

Use the proportion of water and sugar as shown in Table 1. Heat sugar and water together until sugar dissolves. Skim off foam if necessary. Light corn syrup, high fructose corn syrup, or mild-flavored honey can be used to replace up to half of the granulated sugar in syrups.

Table 1. Preparing and Using Syrups

Syrup Type	Approx. % Sugar	For 9-pint or 4-quart load		For 7-quart load		Fruits commonly packed in syrup
		Water (cups)	Sugar (cups)	Water (cups)	Sugar (cups)	
Very Light	10	6½	¾	10½	1¼	Approximates natural sugar level in most fruits
Light	20	5¾	1½	9	2¼	Very sweet fruit
Medium	30	5¼	2¼	8¼	3¾	Sweet apples, sweet cherries, berries
Heavy	40	5	3¼	7¾	5¼	Tart apples, apricots, sour cherries, gooseberries, nectarines, peaches, pears, plums

To raw pack

Put raw fruit into jars and cover with boiling syrup, juice, or water. Most raw fruits should be packed tightly into the jars because they shrink during processing.

To hot pack

Heat fruits in syrup, water, extracted juice, or steam before packing. Juicy fruits may be preheated without added liquid and packed in the cooking liquid. Hot food should be at or near boiling temperature and packed loosely.

Process filled jars

To use boiling water canner

Fill canner halfway with water and preheat to 180°F for hot packs or

140°F for raw packs. Load sealed jars into canner. Be sure water can circulate freely around each jar. Add boiling water to a level of 1 to 2 inches above the jars. Bring water in canner to a vigorous boil, adjust heat to maintain a gentle boil, and cover. Process for the time specified in Table 3. Do not reduce the processing time. Keep water boiling (212°F) during the entire processing period. If water evaporates, add boiling water to keep it at least 1 inch over the top of jars. Leave the lid on the canner. Remove jars when the processing time is up.

To use pressure canner

Partially fill canner with 2 to 3 inches of water. Place jar rack and sealed jars in canner. Fasten lid. Heat on high.

After steam exhausts for 10 minutes, add weighted gauge or close petcock. Allow canner to reach designated pressure. Start timing when designated pressure is reached. Regulate heat to maintain a uniform pressure. Process for the time recommended in Table 4. Do not reduce the processing time. When processing is complete, remove canner from the burner. Let canner cool at room temperature until it is fully depressurized. This will take 30 to 60 minutes depending on canner type. Do not rush the cooling by

setting the canner in water or by running cold water over the canner. Never attempt to hasten pressure reduction by lifting the weight or opening the vent. Carefully open the petcock or remove the weighted gauge. Wait 2 minutes, then slowly release and remove the canner lid.

Check and store jars

After removing jars from canner, set them upright on a rack or folded cloth away from drafts. Do not tighten screw bands. Allow jars to cool undisturbed for 12 to 24 hours, then

check for sealing failures. To test seal, press center of lid. If lid is down and will not move, jar is sealed. Remove screw bands carefully. Wash, dry, label and store jars in a cool, dark place.

If any jars have not sealed, place in refrigerator. Fruit can be reprocessed with fresh liquid, new lids, and clean jars, and the full processing time, but quality will be affected.

Canned fruit is safe as long as the lid remains sealed. Never use products that show evidence of mold.

Check Altitude

As altitude increases, water boils at a lower temperature (below 212°F). Lower temperatures are not as effective for destroying microorganisms that can cause food spoilage and illness. Therefore, when using a boiling water canner, processing time must be increased as altitude increases. If using a pressure canner, pressure must be increased as elevation increases. Follow the altitude adjustments in Tables 3 and 4. Refer to the map on this page for the altitude of your county.

Shaded areas are less than 1,000 feet; unshaded areas are 1,000 to 2,000 feet



Map prepared by Iowa Department of Natural Resources, Geological Survey Bureau

Table 2. Directions for Preparing and Packing Fruit

Product	General Preparation Method
Apples	Wash, peel, core, and slice apples. To keep fruit from darkening, drop slices into ascorbic acid solution. Place drained slices in large saucepan containing one pint water or very light, light, or medium syrup per 5 pounds of sliced apples. Boil 5 minutes, stirring occasionally. Fill jars with hot apples and cover with hot syrup or water, leaving ½ inch headspace.
Apple juice	Buy fresh juice from a local cider maker within 24 hours after pressing. Refrigerate juice 24 to 48 hours; carefully pour off clear juice and discard sediment. Strain clear liquid through paper coffee filters or damp cheesecloth. Pour juice in a large kettle. Heat quickly, until juice begins to boil. Immediately fill sterile pint or quart jars (see directions on page 1) or clean half-gallon jars, leaving ¼ inch headspace.
Applesauce	Wash, peel, and core apples. If desired, slice apples into ascorbic acid solution to prevent browning. Place drained slices in an 8- to 10-quart pot. Add ½ cup water. Heat quickly until tender (5 to 20 minutes, depending on maturity and variety); stir occasionally. Press apples through a sieve or food mill; omit the pressing step if you prefer chunk-style sauce. If desired, sweeten with 2 tablespoons sugar per quart of sauce. Heat sauce to boiling. Fill jars with hot sauce, leaving ½ inch headspace.
Apricots	Follow pre-treatment, packing method, and processing time for peaches. Apricots can be peeled or left unpeeled, and packed hot or raw.
Berries	<i>Use this method for blackberries, blueberries, currants, dewberries, elderberries, gooseberries, huckleberries, logan berries, mulberries, and raspberries.</i> Choose ripe, sweet berries with uniform color. Wash 1 or 2 quarts of berries at a time; drain. Remove caps and stems if necessary. For gooseberries, snip off heads and tails with scissors. Prepare and boil preferred syrup. Add ½ cup syrup, juice or water to each clean jar.
	Hot pack Use for blueberries, currants, elderberries, gooseberries and huckleberries. Heat berries in boiling water for 30 seconds and drain. Fill jars and cover with hot liquid, leaving ½ inch headspace.
	Raw pack Use for any type of berry. Gently shake down berries while filling. Cover with hot syrup, juice or water, leaving ½ inch headspace.
Cherries (sweet or sour)	Select bright, uniformly colored, mature cherries. Stem and wash cherries. Remove pits if desired. If pitted, place cherries in ascorbic acid solution to prevent stem-end discoloration. If canned unpitted, prick skins on opposite sides with a clean needle to prevent splitting. Cherries may be canned in water, apple juice, white grape juice, or syrup. If syrup is desired, select and prepare preferred type as directed.
	Hot pack In a large saucepan add ½ cup of water, juice, or syrup for each quart of drained fruit and bring to boil. Fill jars with cherries and cooking liquid, leaving ½ inch headspace.
	Raw pack Add ½ cup hot water, juice, or syrup to each jar. Fill jars with drained cherries; gently shake down cherries while filling. Add more hot liquid, leaving ½ inch headspace.
Fruit cocktail	Stem and wash 1½ pounds seedless green grapes, and hold in ascorbic acid solution. Select 3 pounds ripe, firm peaches. Dip peaches, a few at a time, in boiling water for 30 to 60 seconds to loosen skin. Dip in cold water and slip off skins. Cut peaches in half, remove pits, cut into ½-inch cubes, and keep in solution with grapes. Peel, halve, and core 3 pounds pears. Cut into ½-inch cubes, and keep in solution with grapes and peaches. Combine 3 cups sugar and 4 cups water in a saucepan and bring to a boil. Drain mixed fruit. Add ½ cup of hot syrup to each of six one-pint jars. Then add a few maraschino cherries and gently fill the jar with mixed fruit and more hot syrup, leaving ½ inch headspace.

Table 2. Directions for Preparing and Packing Fruit (continued)

Fruit puree	<p><i>Use any fruit except figs and tomatoes.</i></p> <p>Stem, wash, drain, peel, and remove pits if necessary. Measure fruit into large saucepan, crushing slightly if desired. Add 1 cup hot water for each quart of fruit. Cook slowly until fruit is soft, stirring frequently. Press through sieve or food mill. If desired, sweeten with sugar. Heat pulp to boiling, or until sugar dissolves. Fill jars with hot puree, leaving $\frac{1}{4}$ inch headspace.</p>				
Grapefruit and orange sections	<p>Select firm, mature, sweet fruit of ideal eating quality. The flavor of orange sections is best if the sections are canned with equal parts of grapefruit. Grapefruit can be canned without oranges. Wash and peel fruit; remove white tissue to prevent a bitter taste. Prepare a very light, light, or medium syrup and bring to boil. Fill jars with sections and hot syrup, leaving $\frac{1}{2}$ inch headspace.</p>				
Grape juice	<p>Wash and stem grapes. Place grapes in a saucepan and cover with boiling water. Simmer slowly until skins are soft. Strain fruit through a damp jelly bag or double layers of cheesecloth. Refrigerate juice for 24 to 48 hours. Carefully pour off and save clear liquid; discard sediment. If desired, strain through a paper coffee filter for a clearer juice. Pour juice into a saucepan; sweeten to taste. Heat, stirring until sugar dissolves. Continue heating, stirring occasionally until juice begins to boil. Immediately fill sterile pint or quart jars (see directions on page 1) or clean half-gallon jars, leaving $\frac{1}{4}$ inch headspace.</p>				
Nectarines	<p>Follow pretreatment, packing method, and processing time for peaches. Pack hot or raw.</p>				
Peaches	<p>Choose ripe, mature fruit of ideal quality. Dip fruit in boiling water for 30 to 60 seconds until skins loosen. Dip quickly in cold water and slip off skins. Cut in half, remove pits; slice if desired. To prevent darkening, keep peeled fruit in ascorbic acid solution. Prepare and boil a very light, light or medium syrup or pack peaches in water, apple juice, or white grape juice. Hot packs make better quality peaches.</p> <table border="1"><tr><td>Hot pack</td><td><p>In a large saucepan place drained fruit in syrup, water, or juice and bring to boil. Fill jars with hot fruit and cooking liquid, leaving $\frac{1}{2}$ inch headspace. If canning halves, place fruit in jars in layers, cut side down.</p></td></tr><tr><td>Raw pack</td><td><p>Fill jars with raw fruit, cut side down, and add hot water, juice, or syrup, leaving $\frac{1}{2}$ inch headspace.</p></td></tr></table>	Hot pack	<p>In a large saucepan place drained fruit in syrup, water, or juice and bring to boil. Fill jars with hot fruit and cooking liquid, leaving $\frac{1}{2}$ inch headspace. If canning halves, place fruit in jars in layers, cut side down.</p>	Raw pack	<p>Fill jars with raw fruit, cut side down, and add hot water, juice, or syrup, leaving $\frac{1}{2}$ inch headspace.</p>
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Raw pack	<p>Fill jars with raw fruit, cut side down, and add hot water, juice, or syrup, leaving $\frac{1}{2}$ inch headspace.</p>				
Pears	<p>Choose ripe, mature fruit of ideal quality. Wash and peel pears. Halve lengthwise and remove core. A melon baller or metal measuring spoon works well for coring pears. To prevent discoloration, keep pears in an ascorbic acid solution. Prepare a very light, light, or medium syrup or pack pears in apple juice, white grape juice, or water. Boil drained pears 5 minutes in syrup, juice, or water. Fill jars with hot fruit and cooking liquid, leaving $\frac{1}{2}$ inch headspace. Raw pack is not recommended.</p>				
Plums	<p>Select deep-colored, mature fruit of ideal quality. Stem and wash plums. To can whole, prick skins on two sides of plums with fork to prevent splitting. Freestone varieties may be halved and pitted. Prepare very light, light, or medium syrup.</p> <table border="1"><tr><td>Hot pack</td><td><p>Add plums to hot syrup and boil 2 minutes. Cover saucepan and let stand 20 to 30 minutes. Fill jars with hot plums and cooking syrup, leaving $\frac{1}{2}$ inch headspace.</p></td></tr><tr><td>Raw pack</td><td><p>Fill jars with raw plums, packing firmly. Add hot syrup, leaving $\frac{1}{2}$ inch headspace.</p></td></tr></table>	Hot pack	<p>Add plums to hot syrup and boil 2 minutes. Cover saucepan and let stand 20 to 30 minutes. Fill jars with hot plums and cooking syrup, leaving $\frac{1}{2}$ inch headspace.</p>	Raw pack	<p>Fill jars with raw plums, packing firmly. Add hot syrup, leaving $\frac{1}{2}$ inch headspace.</p>
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Raw pack	<p>Fill jars with raw plums, packing firmly. Add hot syrup, leaving $\frac{1}{2}$ inch headspace.</p>				
Rhubarb	<p>Freeze rhubarb for best quality.</p>				
Strawberries	<p>Strawberries are best if frozen; they lose flavor and color when canned.</p>				

Table 3. Recommended Processing Times for Fruits in a Boiling Water Canner

* Foods processed less than 10 minutes must be packed in sterile jars (see page 1).

Fruit	Pack	Jar Size	Minutes of processing at altitudes of	
			0-1,000 ft	1,001-3,000 ft
Apples	Hot	Pints/Quarts	20	25
Apple juice	Hot	Pints/Quarts	5*	10
		Half-gallons	10	15
Applesauce	Hot	Pints	15	20
		Quarts	20	25
Berries	Hot	Pints/Quarts	15	20
	Raw	Pints	15	20
		Quarts	20	25
Cherries, sour or sweet	Hot	Pints	15	20
		Quarts	20	25
	Raw	Pints/Quarts	25	30
Fruit cocktail	Raw	Pints	20	25
Fruit purees	Hot	Pints/Quarts	15	20
Grapefruit and orange sections	Raw	Pints/Quarts	10	15
Grape juice	Hot	Pints/Quarts	5*	10
		Half-gallons	10	15
Peaches, apricots, nectarines	Hot	Pints	20	25
		Quarts	25	30
	Raw	Pints	25	30
		Quarts	30	35
Pears	Hot	Pints	20	25
		Quarts	25	30
Plums	Hot/Raw	Pints	20	25
		Quarts	25	30

Table 4. Recommended Processing Times for Fruits in a Pressure Canner

(Times are not available for apple juice, fruit cocktail, or grape juice).

Fruit	Pack	Jar Size	Minutes Processing Time	Canner pressure at altitudes of		
				0-2,000 ft Dial gauge (pounds)	0-1,000 ft Weighted gauge (pounds)	Above 1,000 ft Weighted gauge (pounds)
Apples	Hot	Pints/Quarts	8	6	5	10
Applesauce	Hot	Pints	8	6	5	10
		Quarts	10	6	5	10
Berries	Hot	Pints/Quarts	8	6	5	10
	Raw	Pints	8	6	5	10
		Quarts	10	6	5	10
Cherries, sour or sweet	Hot	Pints	8	6	5	10
		Quarts	10	6	5	10
	Raw	Pints/Quarts	10	6	5	10
Fruit purees	Hot	Pints/Quarts	8	6	5	10
Grapefruit and orange sections	Hot	Pints/Quarts	8	6	5	10
	Raw	Pints	8	6	5	10
		Quarts	10	6	5	10
Peaches, apricots, nectarines	Hot	Pints/Quarts	10	6	5	10
	Raw	Pints/Quarts	10	6	5	10
Pears	Hot	Pints/Quarts	10	6	5	10
Plums	Hot	Pints/Quarts	10	6	5	10
	Raw	Pints/Quarts	10	6	5	10

Table 5. Typical Problems

If there is any doubt in your mind whether canned food is spoiled, don't use it. Burn any spoiled food or dispose of it so that it will not be eaten by humans or animals.

Condition	Causes	Prevention
Food darkens at top of jar.	<ol style="list-style-type: none">1. Liquid did not cover food.2. Food not processed long enough to destroy enzymes.3. High vacuum not produced during processing.4. Air was sealed in the jars either because headspace was too large or air bubbles were not removed.	<ol style="list-style-type: none">1. Cover food with liquid before capping jars.2. Process each food by recommended method and for correct time.3. Pack and process as recommended.4. Use specified amount of headspace. Remove air bubbles with a non-metal spatula.
Fruits darken after they have been removed from jar.	Fruit not processed long enough to deactivate enzymes that cause browning reaction.	Process each fruit by recommended method and for correct time. Begin counting time only after water reaches a full boil in the canner.
Cloudy liquid (may denote spoilage)	<ol style="list-style-type: none">1. Spoilage (<i>do not use</i>).2. Minerals in water.	<ol style="list-style-type: none">1. Process each food by recommended method and for specified time.2. Use soft water.
Loss of liquid during processing. (Food may darken but will not spoil. Do not open jars to replace liquid.)	<ol style="list-style-type: none">1. Food not heated before packing.2. Jars packed too tightly or too full.3. Air bubbles not removed before capping the jar.4. Pressure canner not operating correctly.5. Pressure lowered suddenly.6. Jars not covered with water in boiling water canner.	<ol style="list-style-type: none">1. Heat food before packing.2. Pack food more loosely. Leave recommended headspace.3. Remove air bubbles by running non-metal spatula between food and jar.4. Pressure should not fluctuate during canning process. Keep heat constant.5. Allow pressure to drop to zero naturally; wait 2 minutes before opening lid.6. Jars should be covered 1 inch with water.
Jar seals, then comes open. Spoilage evident. (Do not use.)	<ol style="list-style-type: none">1. Under processed.2. Particles of food left on the sealing surface.3. Hairline crack in jar.	<ol style="list-style-type: none">1. Process each food by recommended method and for specified time.2. Wipe rim and threads of jar with clean, damp cloth before capping.3. Check jars, discard ones unsuitable for canning.
Jars of food fail to seal.	<ol style="list-style-type: none">1. Failure to follow instructions for using jar and lid.2. Food may have been forced up between the jar and lid during processing.3. Sealing compound defective.4. Edge of lid bent or jar rim chipped.5. Food particles on rim jar.6. Screw band tightened after jar removed from canner.	<ol style="list-style-type: none">1. Carefully follow directions.2. Use recommended headspace; do not let pressure fluctuate; allow pressure to drop to zero naturally.3. Use new lids.4. Check lids and jars prior to use.5. Wipe jar edge before putting on lid.6. Allow jars to cool undisturbed.

Table 5. Typical Problems (continued)

Jars break.	1. Hairline crack in jar. 2. Rack not used in bottom of canner. 3. Screw bands applied too tightly so that air could not escape during processing. 4. Standard canning jars not used.	1. Check jars prior to processing. Be careful when packing and processing jars. 2. Use rack and recommended amount of water. 3. Apply screw bands more loosely. 4. Use jars made for canning.
Pink, red, blue, or purple color in canned pears, apples and peaches	A harmless chemical change that occurs in cooking fruit.	None
Fruit floats in jar.	Fruit is lighter than the syrup.	Use firm, ripe fruit. Heat fruit before packing. Use a light to medium syrup. Pack fruit closely without crushing.

For more information

• Call Iowa State University Extension's toll-free Answer Line at 1-800-262-3804 (voice) or 1-800-854-1658 (telecommunications device for deaf).

• Ask your ISU Extension county office for these publications.

PM 638, *Canning, Freezing Tomatoes*

PM 1045, *Freezing Fruits & Vegetables*

PM 1366, *Making Fruit Spreads*

• Check the Internet

ISU Extension publications site: <http://www.extension.iastate.edu/Pages/pubs/fo1.htm>

The Penn State Food Preservation Database World Wide Web Site offers recommended procedures and recipes in an easy to find (and search) format at <http://foodsafety.cas.psu.edu/Presqueryform.htm>

The U.S. Department of Agriculture's *Complete Guide to Home Canning* is available at <http://extension.usu.edu/publica/foodpubs.htm>

... and justice for all

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