



preserve it right

Freezing fruits and vegetables

Freezing is a quick, convenient, and popular way to preserve fruits and vegetables. Freezing is not usually as economical as canning, but it preserves more nutrients in the food if properly done.

Freezing retards the growth of bacteria, molds, and yeasts. Once the food is thawed, microorganisms may continue to grow.

Natural enzymes in foods cause changes in flavor, color, texture, and nutritive value. Freezing slows this activity but does not stop it. To prevent further enzyme activity, vegetables need to be blanched in boiling water or steamed before freezing.

Some nutrient loss occurs when vegetables are blanched before freezing. By comparison, however, the nutrient losses from enzymatic activity are greater if vegetables are not blanched.

Enzymatic browning in light colored fruits can be prevented by using ascorbic acid mixtures or other substances.

If fruits and vegetables are not properly packaged, air can cause changes that affect flavor.

Moisture from the food can evaporate, causing the food to become dry and tough. Off-flavors will develop. To prevent this “freezer burn,” use moisture vapor-proof or resistant packaging, such as “can or freeze” glass jars, plastic freezing containers, heavy weight aluminum foil, plastic coated freezer paper, and plastic wraps.

Be sure to use sealing tape that is designated for freezer use; other tapes will not adhere at freezing temperatures. Freezer bags are popular and can be placed within rigid cartons or containers for easy stacking. Plastic sandwich bags and waxed

paper are not suitable. Freeze and cook bags are expensive but convenient. A heat sealer is needed for closing them.

The water in fruits and vegetables expands during freezing and breaks the cell walls. That’s why thawed foods sometimes have a soft, mushy texture.

To maintain as much of the crisp texture as possible, fruits and vegetables should be frozen at the lowest possible setting on the freezer. Freeze no more than can be solidly frozen in 24 hours. This is usually 2 to 3 pounds of food for each cubic foot of available storage space. Store frozen foods at 0°F or lower.

While some nutrients are lost during storage, the loss is lower when stored at 0°F or below than when stored at higher temperatures. Constant storage temperature helps in retention of quality. Fluctuating temperature will damage the texture of frozen fruits and vegetables as the ice melts and then refreezes in the cells.

Steps in Freezing Vegetables

1. Choose young, tender vegetables at their peak of flavor and texture. Freeze as soon after picking as possible. Refrigerate vegetables if they cannot be frozen soon. Check with your county extension office for cultivars that freeze well.
2. Work in small quantities.
3. Blanch in boiling water or steam. Start counting blanching time as soon as the vegetable is placed in boiling water or in steamer. See Table 1, *Preparing Vegetables for Freezing*, on page 3.

• **To blanch in boiling water—** Blanch no more than 1 pound of vegetables per gallon of boiling water at a time. Immerse wire

basket or mesh bag with vegetable in boiling water. Cover and blanch for required time.

• **To steam blanch—**Place one layer of vegetables in a wire basket suspended above several inches of rapidly boiling water in steamer. Cover. Steam for about 1½ times longer than suggested time for blanching in Table 1.

Generally, water blanching takes less time and fuel. However, the nutrient losses may be somewhat less for steam blanching.

• **Microwave oven blanching—** Because microwave ovens do not have standardized power levels, it is impossible to publish a timetable that can be used with all ovens. Follow directions given by the oven manufacturer. The times in this leaflet are for conventional cooking. Little research has been published on the effectiveness of blanching in the microwave oven. Some studies have shown microwave-blanched vegetables to be lower in vitamin C and color than steam- or water-blanched vegetables.

4. Cool immediately in ice water for the same time as for blanching. Drain thoroughly.
5. Pack tightly in freezer bags or rigid containers. Squeeze as much air as possible from bags before sealing. Leave ½-inch headspace for expansion in containers.
6. Label with product and date. Freeze at lowest possible setting.
7. Vegetables may be placed in single layer on a tray and frozen until nearly solid. Transfer to freezer bag or container. Seal and label.
8. Store at 0°F or lower. Use within 8 to 12 months for best quality and nutrient retention.

Using Frozen Vegetables

Most frozen vegetables can be cooked without thawing. However, corn on the cob should be partially defrosted. Cook vegetables in a small amount of water, $\frac{1}{2}$ cup or less. Cook until just tender—about half as long as if the vegetable were fresh.

Steps in Freezing Fruits

1. Do not use underripe or overripe fruit. The flavor and texture will be undesirable. Check with your county extension office for recommendations on cultivars that freeze well.
2. Wash and sort fruit according to size. Work with a small amount at a time.
3. Pare and remove pits, seeds, and blemishes. Leave whole, slice, or puree according to Table 2, *Preparing Fruits for Freezing*, on page 4.
4. Use an anti-darkening agent on fruits that turn brown. Ascorbic acid preparations or sodium bisulfite are the most effective. Use amounts recommended in Table 2 or in manufacturer's directions. Sodium bisulfites should not be used if individuals are sulfite sensitive.
5. Use dry sugar, syrup, or unsweetened pack. The flavor, color, and texture of most fruits is retained best when some sweetening is used.

- **Dry Sugar**—A 3 to 1 ratio is usually used (3 pounds fruit to 1 pound sugar or 1 quart fruit to $\frac{1}{2}$ cup sugar). However, less sugar can be used. Sprinkle sugar over fruit. Gently stir until pieces are coated with sugar and juice. About 48 calories is added to each half cup serving when using these proportions.

- **Syrup**—A 30 to 40 percent syrup is used for most fruits (see *Syrup Proportions Chart* below). Dissolve sugar in water. Heavy syrups will require heating to dissolve the sugar. Cool and use just enough to cover the fruit. Each pint will require $\frac{1}{2}$ to $\frac{2}{3}$ cup syrup. Keep

fruit under syrup with a small piece of crumpled, water-resistant wrapping material on top of the fruit. Then close and seal the container.

- **Unsweetened**—Use with frozen fruit that will be used later in jams, jellies, pies, or special diets. Fruit also may be packed in its own juice, other fruit juices, or water to which an anti-darkening agent is added. Gooseberries, currants, cranberries, blueberries, and rhubarb freeze well without sugar. Be sure to treat sugarless packs with an anti-darkening agent if the fruit is light colored.

6. Pack in freezer bags or rigid containers. Squeeze as much air as possible from bags before sealing. Leave $\frac{1}{2}$ -inch headspace for expansion in containers.
7. Label with product and date. Freeze at lowest possible setting.
8. Whole berries may be placed in a single layer on a tray and frozen until nearly solid. Transfer to freezer bag or containers.
9. Store at 0°F or lower. Use within 8 to 12 months for best quality. Unsweetened fruits lose quality faster than those sweetened with sugar or syrup.

Using Frozen Fruits

Thaw fruit at room temperature in its original package. If faster defrosting is required submerge in lukewarm water or partially defrost in microwave oven. Serve with a few ice crystals still remaining. Completely thawed fruits will be limp or mushy.

When the Freezer Goes Off

1. Keep the freezer closed. A fully loaded freezer should keep food frozen for 1 or 2 days if the door isn't opened.
2. Move the food to a locker plant.
3. Add dry ice if you can get it. The more dry ice used, the longer the food will keep. Twenty-five pounds should hold the temperature of a half-full cabinet below freezing for 2 or 3 days

or fully loaded for 3 or 4 days. Be careful when handling dry ice. Put heavy cardboard directly on the packages and then put the dry ice on top of the cardboard. Cover freezer with blankets making sure that the motor and vent are not covered.

You can safely refreeze fruits and vegetables that have partially thawed if they still contain ice crystals. The quality will not be as good, however.

Fruits and fruit products are likely to ferment after they have been completely thawed and warmed up above 45°F. They will not taste as good, but they will not be harmful.

Vegetables contain bacteria that multiply rapidly and it may be impossible by their odor to tell if they have started to spoil. If they are still cold (40°F) and have not been thawed for more than 1 or 2 days they may be cooked or refrozen. Quality will be lost. If the temperature is higher than 40°F, the vegetables may be unsafe.

Freezing Vocabulary

Antioxidant—A chemical agent that inhibits oxidation; also known as anti-browning agent. Examples are ascorbic acid and sodium bisulfite which control discoloration in fruits.

Ascorbic acid—White crystalline vitamin C, which is used to control discoloration of fruits.

Citric acid—An acid derived from citrus fruits, such as lemons and limes, and used as an antioxidant to control discoloration of fruits.

Enzyme—A protein that promotes chemical reactions in food. It starts decomposition, changes in color, flavor, and texture. Enzyme action slows down in frozen food.

Freezer burn—Dehydration of improperly packaged frozen food, which leads to changes in color, flavor, and texture.

Scald—To blanch; to loosen skin of fruits and vegetables by dipping in boiling water for a short period of time. Also to hold vegetables in boiling water to slow or stop action of enzymes.

Syrup Proportions Chart

Type syrup	Sugar	Water	Yield	Calories per cup syrup
30%	2 cups (480 ml)	4 cups (960 ml)	5 cups (1,200 ml)	308
40%	3 cups (720 ml)	4 cups (960 ml)	5½ cups (1,320 ml)	420
50%	4¾ cups (1,140 ml)	4 cups (960 ml)	6½ cups (1,560 ml)	562

Table 1. Preparing Vegetables for Freezing

Vegetables	Preparation and blanching in boiling water
Asparagus	Wash and sort small, medium, and large stalks. Leave whole or cut in 1- or 2-inch lengths. Blanch small stalks 2 minutes. Blanch medium stalks 3 minutes, large stalks ($\frac{1}{2}$ - to $\frac{3}{4}$ -inch diameter) 4 minutes. Chill in ice water for same time.
Beans (green and yellow podded)	Wash, snip off tips, and sort for size. Cut or break into suitable pieces or freeze small beans whole. Blanch 3 minutes. Chill in ice water 3 minutes.
Beans, lima	Wash, shell, and sort. Blanch small beans 2 minutes; medium beans, 3 minutes; large beans 4 minutes. If desired, blanch in the pod and shell after cooling. Chill in ice water for same time.
Beets	Remove all but 2 inches of top; wash. Cook until tender. Chill. Remove skins. Slice or dice large beets. Since beets are completely cooked, blanching is unnecessary.
Beans and green soybeans	Harvest when beans have filled the pod and in the green stage; wash. Boil beans in the pods for 5 minutes. Cool promptly in ice water. Squeeze beans out of the pods.
Broccoli	Remove tough leaves and woody butt ends. Cut through stalks lengthwise, leaving heads 1 inch in diameter. Soak $\frac{1}{2}$ hour in salt brine ($\frac{1}{2}$ cup salt to 1 quart water) to drive out small insects. Rinse and drain. Blanch 3 minutes in water or steam-blanch 5 minutes. Chill in ice water.
Brussels sprouts	Wash and trim. Soak $\frac{1}{2}$ hour in salt brine (see <i>Broccoli</i>). Rinse and drain. Blanch small heads 2 minutes; medium heads 4 minutes; large heads 5 minutes. Chill in ice water.
Cabbage	Wash and discard coarse outer leaves. Cut into wedges or shred coarsely. Blanch wedges 3 minutes and shredded cabbage $1\frac{1}{2}$ minutes. Chill in ice water.
Carrots	Trim, wash, and scrape. Dice or slice $\frac{1}{4}$ -inch thick. Blanch 2 minutes. Chill in ice water.
Cauliflower	Trim and wash. Slit heads into individual pieces 1 inch in diameter. Soak $\frac{1}{2}$ hour in salt brine (see <i>Broccoli</i>). Rinse and drain. Blanch 3 minutes. Chill in ice water.
Sweet corn, on-the-cob	Husk, remove silks, and trim ends. Use a large kettle for blanching. Blanch small ears ($1\frac{1}{4}$ -inch diameter) 7 minutes; medium ears ($1\frac{1}{4}$ - $1\frac{1}{2}$ -inch diameter) 9 minutes; large ears (over $1\frac{1}{2}$ -inch diameter) 11 minutes. Chill in ice water until cool. Corn that is not thoroughly cooled may become mushy. Cooling corn-on-the-cob will take longer than blanching time.
Sweet corn, cut whole kernel	Husk, remove silks, and trim ends. Use a large kettle. Blanch whole kernel corn to be cut from the cob $4\frac{1}{2}$ minutes. Chill in ice water. Cut from cob after cooling.
Corn, cream style	Prepare as for whole kernel corn except cut only the kernel tips; then scrape the cobs with the back of a knife to form juice and remove the heart of the kernel.
Herbs	Wash and drain, but do not blanch leaves. Wrap a few sprigs or leaves in foil or seal in plastic bags. Store in carton or glass jar in freezer.
Kohlrabi	Remove tops, wash, peel, and dice in $\frac{1}{2}$ -inch cubes. Blanch 1 minute. Chill in ice water.
Mushrooms	Wash and remove stem base. Freeze small mushrooms whole; cut large ones into 4 or more pieces. When blanching mushrooms, add 1 teaspoon citric acid, or 1 tablespoon lemon juice, or $\frac{1}{2}$ teaspoon ascorbic acid per quart of water to prevent darkening. Blanch medium or small whole mushrooms 5 minutes; cut pieces 3 minutes. Chill in ice water.
Okra	Wash. Cut off stems without opening seed cells. Blanch small pods 3 minutes; large pods 4 minutes. Chill in ice water.

Table 1. Preparing Vegetables for Freezing (continued)

Vegetables	Preparation and blanching in boiling water
Peas (green, english, blackeyed)	Wash. Shell small amount at a time. Blanch green and english for 1½ minutes. Blanch blackeyed peas 2 minutes. Chill in ice water.
Peas (edible, podded, sugar, or Chinese)	Wash. Remove stems, blossom ends, and any string. Leave whole. Blanch 1½ to 3 minutes. Chill in ice water.
Peppers (hot varieties)	Do not handle or cut without plastic or rubber gloves. Select crisp green or bright red pods. Wash and drain.
Peppers (sweet, green, and red)	Wash, cut out stem, and remove seeds. Halve. Blanch halved peppers 3 minutes. Chill in ice water. Chopped peppers can be frozen without blanching.
Pumpkin and winter squash	Cut or break into fairly uniform pieces. Remove seeds. Bake at 350°F, or steam until tender. Cool, scoop pulp from rind, and mash or put through ricer. Spoon into moisture-proof containers. If freezing pie mix, omit cloves.
Potatoes	Wash; peel; remove deep eyes, bruises, and green surface coloring. Cut in ¼- to ½-inch cubes. Blanch 5 minutes. Cool. For hash browns—cook unpeeled until almost done; peel and grate; form in desired shapes; freeze. For french fries—peel and cut in thin strips; fry in deep fat until very light golden brown; drain and cool; complete browning before serving.
Potatoes, new	Choose those of uniform size; scrub vigorously to remove tender skin. For ¾-inch diameter potatoes, blanch 4 minutes. For 1-inch diameter, blanch 6 minutes. For 1½-inch diameter, blanch 7 minutes. For those larger than 1½-inch diameter, blanch 8 to 10 minutes. Chill potatoes in ice water 3 to 5 minutes; drain well. Use within a month for best quality.
Spinach and other greens	Sort and remove tough stems. Blanch most leafy greens 2 minutes. Blanch collards and stem portions of Swiss chard 3 to 4 minutes. Blanch very tender spinach 1½ minutes. Chill in ice water.
Summer squash and zucchini	Wash, peel, and cut in ½-inch slices. Blanch 3 minutes. Chill in ice water.
Tomatoes, cooked	Select firm, sound, ripe tomatoes. Wash, core, cut, and cook until soft.
Tomato juice and purée	Select firm, sound, ripe tomatoes. Wash, core, and cut into pieces. Simmer about 5 minutes and put through food mill for juice. Cool. For purée, cook juice until concentrated to about half its volume.

Table 2. Preparing Fruits for Freezing

Fruits	Preparation
Apples	Wash in cold water, peel, core, and cut into pie slices. To prevent darkening, use one of these methods: • Soak slices in sodium bisulfite (USP grade)* solution (1 teaspoon in 1 gallon water) for 5 minutes. Mix solution in glass, earthenware, stainless steel, or enamel container. Drain. Pack using 1 cup sugar for 10-12 cups apples. * Sodium bisulfite (USP grade) is an approved additive; however, it may be difficult to find. Some people, especially hypersensitive asthmatics, may react to sodium bisulfite. Do not use if you know that someone in your family is susceptible. • Soak apple slices in brine solution (½ teaspoon ascorbic acid to 1 quart water). • Scald in boiling water 2 minutes. Chill in ice water. Pack using 1 cup sugar for 10-12 cups apples.

Table 2. Preparing Fruits for Freezing (continued)

Apricots	Quality is better when apricots are canned rather than frozen. Wash in cold water and sort. Dip 6 fully-ripened apricots into boiling water until skins loosen, 15 to 20 seconds. Chill. If desired, peel, halve, and remove pits. Fill containers one-third full of syrup (3 cups sugar to 1 quart water with $\frac{1}{2}$ teaspoon ascorbic acid). Pack apricots in syrup. Or: Halve soft ripe fruit, steam 4 minutes, crush and pack using 1 cup sugar for 8-9 cups fruit.
Avocados	Avocados are not satisfactorily frozen whole or sliced. Select avocados that are soft ripe. Peel, cut in half, and remove pit. Mash until puréed. Add $\frac{1}{8}$ teaspoon ascorbic acid mixture per pint purée. Package. Use purée for sandwiches, dips, and salads.
Blackberries, Boysenberries, Dewberries, Loganberries, Youngberries	Wash in cold water and sort. Pack in syrup (3 cups sugar to 1 quart water). Or crush and pack using 1 cup sugar for 7-8 cups fruit. For pies, pack berries dry without sugar.
Blueberries, Elderberries, Huckleberries	Wash in cold water and sort. For desserts, pack in syrup (3 cups sugar to 1 quart water). Or pack using 1 cup sugar for 8-9 cups fruit. For pies, pack dry without sugar or sugar syrup.
Pie cherries (Red sour)	For pies, use $1\frac{1}{2}$ to 2 cups sugar with 4 cups pitted cherries for 9-inch pie. To improve color, add $\frac{1}{4}$ teaspoon ascorbic acid. Or pack in sugar syrup (4 cups sugar to $4\frac{3}{4}$ cups water).
Sweet cherries	Wash in cold water and sort. Pack in syrup (2 cups sugar to 1 quart water plus $\frac{1}{2}$ teaspoon ascorbic acid) and either 1 teaspoon citric acid or 4 teaspoons lemon juice for flavor.
Cranberries, currants	Wash in cold water, sort, and pack without sugar.
Gooseberries	Wash in cold water and sort. Pack without sugar or syrup, or mix berries and sugar as called for in pie recipe, using 1 to $1\frac{1}{2}$ cups sugar for 4 cups berries.
Grape juice	Choose fully ripe, firm, sweet grapes. Sort, stem, and wash. • For juice as a beverage: Cover with water. Heat slowly to simmering and cook until grapes are soft. Strain through bag and sweeten if desired. Common proportion is about $\frac{1}{2}$ cup sugar per quart juice. • For juice for jelly: Add just enough water to keep grapes from sticking. Cook at simmering until grapes are soft. Strain through jelly bag. Let juice stand in refrigerator overnight to remove tartrate crystals. Strain again.
Melons	Wash in cold water. Peel and cut flesh into $\frac{1}{2}$ - to $\frac{3}{4}$ -inch cubes or balls. Cover with syrup (2 cups sugar to 1 quart water). Flavor with lime juice and/or add whole seedless grapes, if desired. Serve partially frozen.
Peaches	Wash in cold water and sort. Dip 3 or 4 peaches into boiling water until skins loosen. Chill. Peel and slice peaches into containers one-third full of syrup (3 cups sugar to 1 quart water with $\frac{1}{2}$ teaspoon ascorbic acid).
Pears	Select from full-flavored pears, not mealy in texture. Wash, peel and core. Slice. Heat in a boiling syrup in the proportion of 3 cups sugar to 4 cups water for 1-2 minutes. Drain and cool. Add $\frac{3}{4}$ teaspoon ascorbic acid to 1 quart syrup.
Pineapple	Peel and core. Dice, slice, or cut into wedges, removing center core. Cover with syrup (3 cups sugar to 1 quart water). Or pack using 1 cup sugar for 8-9 cups fruit. Do not use uncooked pineapple in gelatin mixtures.

Table 2. Preparing Fruits for Freezing (continued)

Plums	Select firm ripe fruit soft enough to yield to slight pressure. Sort, wash, halve, and pit. For dry sugar pack, use $\frac{1}{2}$ - $\frac{3}{4}$ cup sugar per quart fruit. For syrup pack, cover fruit with a 40 percent syrup (3 cups sugar to 1 quart water). For best quality, add ascorbic acid to the cold syrup.
Raspberries	Pack raspberries for jam without sweetening. Wash in cold water and sort. Pack raspberries in syrup (3 cups sugar to 1 quart water). Or pack using 1 cup sugar for 7-8 cups fruit.
Rhubarb	Remove leaves and woody ends, wash in cold water, and cut in 1-inch lengths. Do not blanch. For sauce, pack in syrup ($3\frac{1}{2}$ cups sugar to 1 quart water). For pies, pack using 1 cup sugar to 4 cups rhubarb, or pack without sugar for use within a few months.
Strawberries	Wash in cold water, sort, and stem. Pack whole, sliced (preferred), or crushed berries with 1 cup sugar for 7-8 cup of fruit. Or pack whole berries in syrup (3-4 cups sugar to 1 quart water).

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 799, *Freezing Prepared Foods*

PM 1366, *Making Fruit Spreads*

PM 1367, *When the Home Freezer Stops*

- 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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