



Preserve Today, Relish Tomorrow

UCCE Master Food Preservers of El Dorado County

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Dehydration and Freezing

Food Safety:

To maintain safety and quality, several factors must be considered when drying fruits, vegetables, and herbs. Keep in mind that specific food products often have recommendations unique to them. Drying removes the moisture from food so 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, vegetables, and herbs 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, in turn, 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.

Foods can be dried in the oven, under the sun, on the vine, or indoors using a dehydrator. There are several resources that provide tested methods for dehydrating vegetables, fruits, and herbs - ask your county UC Cooperative Extension office for information on specific drying methods.

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

- After harvesting produce or herbs, place them in containers and locations free from additional contamination. (For example, some place 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. To effectively clean, wash with warm, soapy water; rinse thoroughly with warm water; and sanitize using one of the following methods:
 - Immerse utensils and drying trays in a chlorine bleach solution (1 ½ tsp of bleach per gallon of water) for 10 seconds, then air dry (do not use a towel). Or, prepare a sanitizing spray solution of ½ tsp of household bleach per quart of water, and spray on food-contact surfaces. Let air dry.
- Always wash hands before handling foods—that includes harvesting.
- Consider wearing disposable gloves when preparing foods for dehydrating. Wash hands before putting gloves on, and always remove gloves whenever you change a task (such as answering the phone or preparing another food item). If your gloves become soiled or torn during food preparation, replace them before resuming food preparation. Do not wash gloves to reuse—dispose of gloves after use. Gloves can give a false sense of security. Change gloves as recommended—do not contaminate food with gloves used incorrectly.

**Household chlorine bleach is a common sanitizer. Use an unscented and unconcentrated bleach for food-contact surfaces and utensils.*

Dehydrating

The overall objective is to remove moisture before the food spoils.

Fruit:

Some foods dry better than others. The following fruits dry well: apples, apricots, blueberries, cherries, cranberries, figs, grapes, huckleberries, peaches, pears and plums.

The following fruits dry less well: blackberries, cantaloupe, lemons, and oranges.

Pretreatment of fruits applies to both dehydration and freezing. Pretreatment of fruits is a personal preference; food safety is not affected. Pretreatment of some fruits before drying will reduce vitamin loss, flavor loss, browning, and deterioration during storage.

Pretreatment Methods

Sodium bisulfite is used by dissolving 2 teaspoons of the powder in 1 quart of water and adding the cut fruit. Dip the fruit in the solution; drain and dehydrate.

Ascorbic Acid is used by dissolving 1 tablespoon of the powder in 1 quart of cold water. Dip the fruit in the solution then 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 then drain and dehydrate.

Citrus Juices: 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 then drain and dehydrate.

Crazing: Some fruits have a protective wax coating, such as plums, figs, cranberries, blueberries, and grapes. It is necessary to pre-treat these fruit by dipping them in boiling water for 3- -60 seconds, according to the size and toughness of the skin.

Sulfuring: The process of sulfuring produce is beyond the scope of this presentation. If you want to learn more here is a link: <https://extension.usu.edu/files/publications/publication/FN-330.pdf>

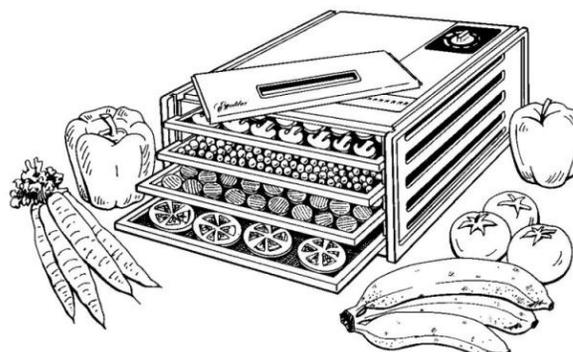
Vegetables:

Almost all vegetables should be blanched by hot water or steam before drying. Exceptions include: peppers, onions and mushrooms.

The following vegetables dry well: beets, cabbage, carrots, celery, corn, green peas, green peppers, mushrooms, onions, garlic, potatoes, tomatoes and turnips.

The following vegetables dry less well: lettuce, radishes, spinach and other greens.

Blanching: Blanching is the process of heating vegetables sufficiently to deactivate enzymes that would cause flavor and color deterioration during either the dehydration or freezing process. Blanch with hot water or steam for the time stated in Table "Freezing Vegetables" on page 8. Green peppers, onions, garlic, mushrooms and okra require no pre-treatment.



Citric Acid Blanch: A small amount of citric acid (¼ teaspoon) added to water, makes blanching more effective in destroying potentially harmful bacteria, including *Esherihiacoli*, *Salmonella species*, and *Listeria monocytogenes*. However, while citric acid acts as an anti-darkening agent for light-colored vegetables, it will cause bright green vegetables to turn olive green.

Meat: The processing of meat and meat jerky is beyond the scope of this presentation and will be covered in the classes on meat preservation. See our schedule of classes here: http://ucanr.edu/edmfip_classes.

Herbs: Temperature range for drying herbs is lower; 95-115° degrees. The following herbs dry well: chervil, rosemary, chives, sage, dill, tarragon, mint, thyme and oregano.

Test for dryness

Fruit: Fruit should be pliable and leather-like, without any pockets of moisture.

Vegetables: Most vegetables will be hard and brittle when dried.

Produce may dry unevenly and some pieces may need to be removed before others.

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

Pasteurizing is necessary for any food products that could have been exposed to insect infestation or larva prior to handling or during the drying process. The food should be frozen after it has been conditioned. Pack the food in airtight containers, removing as much air as possible; place in a freezer at 0°F for at least two days.

Storage:

Moisture must be kept from dried foods when they are in storage. Containers suitable for the freezer work well for storing dried food.

Rehydrate:

There are three basic methods used to rehydrate dried foods: 1. Soak in liquid, 2. Boil in water, and 3. Cook in liquid. Do not add salt or sugar during the first 5 minutes of rehydration as salt hinders the water absorption process. Various fruit juices, yogurt, cordials, and fruit liqueurs may be used instead of water to reconstitute fruits. Place fruit pieces in a shallow pan and cover with the liquid. The general rule is to use 2 cups of fruit to 1 cup of liquid. Add more liquid as needed. Fruit will usually reconstitute in a couple of hours. Refrigerate if it takes longer.

Vegetables may be reconstituted in consommé, bouillon, vegetable juice, water, or milk. Refrigerate during rehydration. Allow plenty of time - from 1 to 2 hours up to 8 hours, depending upon the vegetable.



Freezing Fruits and Vegetables

- Freezing is one of the easiest, most convenient and least time-consuming ways to prepare foods at home.
- Freezing does not sterilize food; the extreme cold simply retards growth of microorganisms and slows down changes that affect quality or cause spoilage in food.
- The quality of frozen fruits and vegetables depends on the quality of the fresh products and how they are handled from the time they are picked until they are ready to eat. It is important, also, to start with high-quality vegetables because freezing will not improve the product's quality.
- Properly frozen fruits and vegetables will retain much of their fresh flavor and nutritive value. Their texture, however, may be somewhat softer than that of fresh fruit.

Freezing Fruit

Fruit may be frozen with or without sugar or with sugar syrup. Some fruits, such as berries, cherries, and grapes, may be frozen in a single layer on cookie sheets before packing in containers. This prevents them from sticking together.

- Juicy fruits and those used for pies or other cooked products are often packed in sugar. Use about 1 cup of sugar for each 2 to 3 pounds of fruit. Gently but thoroughly mix the sugar and fruit until the sugar has dissolved in the juice.

Strength Of Syrup	Water (cups)	Sugar (cups)	Yield (cups)
Light	4	2	5
Medium	4	3	5 ½
Heavy	4	4	6 ¼

Freezing Vegetables

See attached chart for specific directions.

Packing in containers

Pack foods tightly into containers. Allow ample headspace between the packed food and the lid to allow room for expansion during freezing. Products packed in pint containers require ½" headspace. Products packed in quart containers require 1" headspace. When food is packed in freezer bags, squeeze out as much air as possible. Label containers with name of product, date, and use-by date.

Freezing Juices: A variety of fruit juices can be frozen, including cherry, grape, grapefruit, plum, raspberry, and strawberry.

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 frozen for up to 2 days if the freezer is not opened. It is safe to refreeze fruits and vegetables that still have ice crystals in them. If the temperature has warmed above 40°F for more than two hours, foods may not be fit for refreezing.



Preserve it Fresh,
Preserve it Safe

Freezing Fruits

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 pack in 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 (1 cup to 1 quart of puree) if using for ice cream or milk shakes or pack without sugar if using for salads, dips, or sandwiches.
Blackberries	Also boysenberries, loganberries. Select firm, fully ripe fruit with glossy skins. Wash and drain. Pack in syrup, pack in sugar, or pack 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 pack in 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, pack in sugar, or pack without sugar.
Cherries, sweet	Select tree ripened red varieties. Stem and wash. Remove pits if desired. Pretreat if desired. Pack in syrup or pack without sugar.
Currants	Select fully ripe, bright red fruit. Wash and stem. Pack in syrup, pack in sugar, or pack without sugar.
Figs	Select tree-ripened, soft-ripe fruit. Wash and cut off stem. Peel if desired. Slice or leave whole. Pack in syrup, pack in sugar, or pack without sugar.
Gooseberries	Select fully ripe (for pie) or slightly underripe (for jelly) berries. Wash and remove stems and blossom ends. Pack in syrup or pack 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 pack in water without sugar.
Nectarines	Select firm, fully ripe, well-colored fruit. Wash and pit. Peel if desired. Pretreat if desired. Cut in quarters or slices. Pack in syrup, pack in orange juice, or in water without sugar.
Peaches	Select firm, ripe fruit with no green color in the skin. Wash peel, and pit. Cut in quarters or slices if desired. Pretreat if desired. Pack in syrup, pack in sugar, pack in orange juice, or pack in water without sugar.
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 of pieces). Drain, cool, and pack in syrup.
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.

Freezing Vegetables

Asparagus	Select young stalks with compact tips. Wash and sort by size. Leave whole or cut in 1-to-2 inch lengths. Blanch small stalks 1 1/2 minutes, medium stalks 2 minutes, large stalks 3 minutes. Cool immediately.
Beans, green snap or wax	Select young stringless beans. Wash and snip off tips. Cut or break into suitable pieces or slice lengthwise into strips. Blanch 3 minutes. Cool immediately.
Beets	Select beets less than 3 inches across. Sort by size. Remove tops and wash. Cook until tender (small 20 to 30 minutes, medium 45 to 50 minutes). Cool. Peel and slice or dice.
Broccoli	Select compact, dark-green heads. Wash, peel, strip leaves and woody ends. If necessary to remove insects, soak 30 minutes in salt brine (4 tsp salt to 1 gallon of water). Rinse and drain. Cut through stalks lengthwise, leaving heads 1" in diameter. Blanch medium heads 4 minutes, large heads 5 minutes. Cool.
Brussels Sprouts	Select green, firm, compact heads. Wash and trim outer leaves. Soak 30 minutes in salt brine (see broccoli). Rinse and drain. Blanch medium heads 4 minutes, large heads 5 minutes. Cool immediately.
Carrots	Select tender carrots. Remove top. Wash, and scrape. Dice or slice 1/4" thick. Blanch 2 minutes. Cool.
Cauliflower	Select firm, white heads. Wash and trim. Split heads into pieces 1" across. If necessary to remove insects, soak 30 minutes in salt brine (4 tsp salt to 1 gallon water). Rinse, drain. Blanch 3 minutes. Cool.
Corn, cut or on-the-cob	Select ears with plump kernels and thin, sweet milk. Husk ears, remove silk, and wash. <i>Whole-kernel or cream-style:</i> Blanch 4 to 5 minutes. Cool thoroughly. Drain; cut off cob. <i>Corn-on-the-cob ears:</i> 9 minutes, large ears 11 minutes. Cool, drain and wrap each ear separately or tightly pack desired number in large freezer bags or containers.
Mushrooms	Select edible mushrooms free from spots or decay. Wash and remove stem base. Freeze small mushrooms whole, cut large ones into 4 or more pieces. When blanching, add 1/2 tsp citric acid (or 3 tsp lemon juice or 1/2 tsp ascorbic acid) per quart of water to prevent darkening. Blanch medium or small whole mushrooms 5 minutes, cut pieces 3 minutes. Cool. Or: slice mushrooms 1/2" thick and sauté in butter until almost done. Cool by setting pan in cold water.
Onions	Select fully mature onions. Peel, wash and cut into sections. Blanch 1 1/2 minutes. Cool. May be frozen unblanched.
Peas, edible-pod	Select young, tender pods. Wash. Remove stems, blossom ends, and any strings. Blanch small pods 1 minute, large pods 1 1/2 to 2 minutes. Cool.
Peas, green	Select firm, bright green, plump, pods. Shell. Blanch peas 1 1/2 to 2 minutes. Cool.
Peppers, sweet (green)	Select firm, crisp peppers. Wash, cut, and remove seeds. Halve, slice, or dice. Can be frozen without blanching.
Peppers, hot (green chili)	Select firm, crisp peppers. Wash and dry. Broil for 6 to 8 minutes to loosen skin. (First make small slits in each to allow steam to escape.) Cool. Remove peel, seeds, and stems. Protect hands with rubber gloves. Can be frozen without blanching.
Potatoes	Wash, pare; remove deep eyes, bruises, and green surface coloring. Cut in 1/4" to 1/2" cubes. Blanch 5 minutes. Cool. <i>For French fries:</i> Pare and cut into thin strips. Fry in deep fat until light brown. Drain and cool. (To serve, bake at 400° F for 10 to 20 minutes.)
Potatoes, sweet	Select medium to large sweet potatoes. Wash and cook until almost tender. Peel, cut in halves, slice or mash. To prevent browning dip for 5 seconds into solution of 1 Tbsp citric acid or 1/2 cup lemon juice to 1 quart of water. To keep mashed sweet potatoes from darkening, mix 2 Tbsp orange or lemon juice with each quart of mashed potatoes.
Pumpkin	Also other winter squash. Select full-colored, mature pumpkin. Cut or break into fairly uniform pieces. Remove seeds, cut into pieces. Bake at 350° F or steam until tender. Cool. May be frozen in chunks or pureed and frozen.
Spinach	Also other greens. Select young, tender leaves. Remove tough stems. Wash. Blanch most leafy greens 2 minutes. Blanch collards and stem portion of Swiss chard 3 to 4 minutes. Blanch very tender spinach 1 1/2 minutes. Cool.
Tomatoes	Best frozen stewed or pureed. Select ripe tomatoes free from blemishes. Remove stem ends, peel and quarter. Cook until tender. Cool by setting pan in cold water.
Zucchini	Also other summer squash. Select young squash with small seeds and tender rind. Wash and slice. Blanch 1/4" slices 3 minutes, 1 1/2" slices 6 minutes. Cool.

Source: <http://extension.oregonstate.edu/catalog/pdf/pnw/pnw214.pdf>

Produce	Amount purchased or picked		Amount dried product	
	Pounds	Pounds	Pounds	Pints
Beans, lima	7	1 1/4		2
Beans, snap	6	1/2		2 1/2
Beets	15	1 1/2		3 to 5
Broccoli	12	1 3/8		3 to 5
Carrots	15	1 1/4		2 to 4
Celery	12	3/4		3 1/2 to 4
Corn	18	2 1/2		4 to 4 1/2
Greens	3	1/4		5 1/2
Onions	12	1 1/2		4 1/2
Peas	8	3/4		1
Pumpkin	11	3/4		3 1/2
Squash	10	3/4		5
Tomatoes	14	1/2		2 1/2 to 3

Source: *Drying Foods at Home*, Marjorie M. Philips, Cooperative Extension Service, University of Arkansas, Little Rock, Arkansas 72203

Produce	Amount purchased or picked		Amount dried product	
	Pounds	Pounds	Pounds	Pints
Apples	12	1 1/4		3
Grapes	12	2		3
Peaches	12	1 to 1 1/2		2 to 3
Pears	14	1 1/2		3
Tomatoes	14	1/2		2 1/2 to 3

Canned Bean to Dry Bean Conversion Chart

1 cup dried beans = 2 to 2 1/2 cups cooked beans
1 cup dried beans = 1 to 1 1/4 pounds cooked beans

1 can beans = 2 cups cooked beans
1 can beans = 1 cup dried beans

1 pound dried beans = 2 1/2 cups dried beans
1 pound dried beans = 5 to 6 cups cooked beans

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