



# Drying Fruits

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**Drying food is simple, easy to learn and yields foods that are tasty and nutritious. The purpose of drying is to remove enough water from the food so that bacteria, yeast and molds cannot grow to harmful amounts, causing food poisoning and spoilage.**

MT200909HR Revised 2017

## Safety is the Top Priority

Safely preserving foods at home by canning, drying, and freezing requires using processing methods that not only preserve the food but also destroy bacteria and molds that cause foodborne illness or food poisoning. Protect yourself and others when you share home-preserved foods by learning safe preservation techniques. The safest recipes and resources are those that have been researched and rigorously tested by the United States Department of Agriculture (USDA) and Extension Services associated with land-grant universities. Many home-preserved recipes are not tested for safety, so it is critical to use the resources located below.

## Recommended Research-based Food Preservation Resources

National Center for Home Food Preservation (NCHFP), USDA sponsored website is the most current source for publications, video clips, tutorials for the beginning home food preserver, frequently asked questions, and seasonal tips: <http://nchfp.uga.edu/>

USDA *Complete Guide to Home Canning*, 2015. Earlier editions not recommended. Available on NCHFP website, click on 'publications'.

*So Easy to Preserve*, 6th edition only, 2014. Earlier editions not recommended by MSU Extension. <http://www.soeasytopreserve.com>

The following publications are available at local stores or order online. *The All New Ball Blue Book of Canning and Preserving*, 1st ed., 2016; *The Best Ball Home Canning and Preserving Recipes: Fresh Flavors All Year Long*, 1st ed. 2016; *Ball Blue Book Guide to Preserving*, 37th ed., 2014. Earlier editions not recommended.

## Advantages of Food Drying

Food drying is one of the oldest methods of preserving food and is simple and easy to learn. Drying removes the moisture from the food so that bacteria, yeasts, and molds cannot grow and spoil the food. Making safe dry foods requires cleanliness in every step, protecting the food from airborne spoilers and other contaminants, and using food-grade containers, equipment and ingredients.

## Methods of Drying

Fruits can be dried in a food dehydrator, oven or in the sun by using the right combination of warm temperatures, low humidity and air current. The optimum temperature for drying food is 140°F. If higher temperatures are used, the food will cook instead of drying, causing a greater likelihood of food molding. Low humidity aids the drying process. If the surrounding air is humid, then drying will be a slower process. Increasing the air current speeds up drying by moving the surrounding moist air away from the food. Most foods can be dried indoors using modern food dehydrators, countertop ovens or conventional ovens.

## Drying with a Food Dehydrator

A food dehydrator is a small electric appliance for drying foods indoors. A food dehydrator has an electric element for heat and a fan and vents for air circulation. Dehydrators are efficiently designed to dry foods quickly at 140°F. Costs vary from \$50 to \$350 depending on features.

Dehydrator features to look for:

- Double wall construction of metal or high-grade plastic. Wood is not recommended because it is a fire hazard and is difficult to clean.
- Enclosed heating elements.
- Countertop design.
- An enclosed thermostat from 85 to 160°F and a dial for regulating temperature.
- A fan or blower.
- Four to 10 open mesh trays made of sturdy lightweight plastic for easy washing.

- A timer to turn the dehydrator off and prevent scorching if the drying time is completed during the night.
- UL seal of approval, a one-year guarantee and convenient service.

**Types of dehydrators:** There are two basic designs for dehydrators. One has horizontal air flow and the other has vertical air flow. In units with horizontal flow, the heating element and fan are located on the side of the unit. The major advantages of horizontal flow are: it reduces flavor mixture so several different foods can be dried at one time; all trays receive equal heat penetration; and juices or liquids do not drop down into the heating element. Vertical air flow dehydrators have the heating element and fan located at the base or in the lid. If different foods are dried, flavors can mix and liquids can drip into the heating element when it is at the bottom.

### **Oven Drying**

Everyone who has an oven has a food dehydrator. Oven drying is slower than dehydrators because it does not have a built-in fan for air movement. It takes twice as long to dry food in an oven than in a dehydrator, and it uses more energy.

Your oven must have a setting as low as 140°F to use it for drying. If your oven does not go this low, then food will cook instead of dry. For air circulation, leave the oven door propped open 2 to 6 inches. Circulation can be improved by placing a fan outside the oven near the door.

### **Solar-Drying and Sun-Drying**

Solar-drying uses the sun as a heat source, but requires a specially designed dehydrator. Sun-drying is a method to dry fruits outdoors and does not require a dehydrator. The high sugar and acid content of fruits make them safe to dry outdoors when conditions are favorable for drying. Vegetables and meats are not recommended for outdoor drying.

Hot, breezy days with humidity below 60% are best. A minimum temperature of 85°F is required, higher temperatures are better. Fruits dried outdoors must be brought in at night to prevent moisture from condensing on the surface of the fruit. It takes several days for fruit to dry. Because the weather is uncontrollable, sun-drying can be unpredictable.

**Important.** Both solar-dried fruits and sun-dried fruits require a pasteurization treatment to kill insects and their eggs. There are two methods to pasteurize fruits after they have been dried.

1. *Freezer method:* Seal the food in plastic freezer bags. Place them in a freezer set at 0°F or below and leave them for at least 48 hours.
2. *Oven method:* Place the fruit in a single layer on a tray or shallow pan. Place in an oven preheated to 160°F for 30 minutes.

## **Preparing Fruits for Drying**

Some fruits are more suitable for drying than others (refer to Table 1 on page 4). Select fresh and fully ripened fruits. Immature produce lacks flavor and color. Overly mature produce can be tough and fibrous or soft and mushy. Drying does not improve food quality.

Thoroughly wash and clean fruit to remove dirt or chemical residue. Sort and discard any fruit that shows decay, bruises, or mold as such defects can affect all food being dried.

### **Cracking Skins**

Cherries, grapes, plums, blueberries, huckleberries and cranberries will dry faster if their waxlike coating is removed and their skin is cracked lightly in several places. This can be done by dipping the whole fruit for 30 to 60 seconds in briskly boiling water, followed by a similar dip in ice cold water and then thoroughly drain.

### **Pretreating the Fruit**

Pretreating fruits prior to drying is highly recommended. Pretreating helps keep light-colored fruits from darkening during drying and storage and assists the drying of fruits with tough skins, such as grapes and cherries.

There are several methods for pretreating fruits. For long-term storage of fruits, a pretreatment sulfite dip is most effective, but sulfites can cause asthmatic reactions for those with asthma. Other pretreatments are less effective in the long-term, but do not pose health problems.

**Sulfite Dip:** Sulfite dips involve soaking fruit in sodium bisulfite, sodium sulfite or sodium meta-bisulfite that are United States Pharmacopeia (USP) (food grade) or Reagent grade (pure). To locate these products, check where wine-making supplies are sold (store or internet). Some individuals who have asthma or allergies may be sensitive to sulfites, so discuss these products with a pharmacist. A sulfiting solution can be used only once. Make a new solution for each batch of food.

*Directions for Use:* Dissolve ¾ to 1½ teaspoons of sodium bisulfite per quart of water. (If using sodium sulfite, use 1½ to 3 teaspoons. If using sodium meta-bisulfite, use 1 to 2 tablespoons.) Place the prepared fruit in the mixture and soak 5 minutes for slices, 15 minutes for halves. Remove fruit, rinse lightly under cold water and place on drying trays. Sulfited foods can be dried indoors or outdoors.

**Ascorbic Acid:** Ascorbic acid (vitamin C) mixed with water is another way to prevent fruit from browning, though its protection may not last as long as a sulfite dip. Ascorbic acid is available in tablet or powdered form at grocery stores and pharmacies.

*Directions for Use:* Mix 1 teaspoon of powdered ascorbic acid (or 3000 mg of ascorbic acid tablets, crushed) in 2 cups of water. Place the fruit in the solution for 3 to 5 minutes. Remove fruit, drain well and place on dryer trays. After this solution is used twice, add more acid.

**Ascorbic Acid Mixtures:** Ascorbic acid mixtures are a mixture of ascorbic acid and sugar and are sold for use on fresh fruits. This product can be found in the canning and freezing section of the grocery store. Ascorbic acid mixtures are more expensive than pure ascorbic acid and are not as effective.

*Directions for Use:* Mix 1½ tablespoons ascorbic acid mixture with one quart of water. Soak the fruit in the mixture for 3 to 5 minutes. Drain the fruit well and place on dryer trays. After the solution is used twice, add more ascorbic acid mixture.

**Fruit juice dip:** A fruit juice that is high in vitamin C can also be used as a pretreatment, though it is not as effective as pure ascorbic acid. Juices high in vitamin C include orange, lemon, pineapple, grape, fortified apple and cranberry. Each juice adds its own color and flavor to the fruit.

*Directions for Use:* Place enough juice to cover fruit in a bowl. Add cut fruit. Soak 3 to 5 minutes, remove fruit, drain well and place on dryer trays. Solution may be used twice before being replaced. Used juice can be consumed.

**Steam Blanching:** Steam blanching is the least preferred method for pretreating fruits as it destroys the flavor, texture and vitamin A and C content more than other methods.

*Directions:* Place fruit not more than 2 inches deep in a steamer pan or wide basket over boiling water. Cover tightly and begin timing immediately. Check halfway through blanching time to ensure even blanching. Stir fruit if not evenly blanched. Spread the fruit on a clean cloth or paper towel to remove excess moisture before placing on drying trays.

## Drying the Prepared Fruit

Fruit pieces should be placed on the drying trays in a single layer and not overlapping or touching. The high sugar content of fruit makes it very sticky, so it is a good idea to spray the trays with cooking spray before putting on the fruit. Follow the directions for the drying method and dry until the food tests dry, as described below. Watch food closely as it dries more quickly at the end of the drying time and can scorch easily.

## Determining Dryness of Fruits

To test for dryness, cut several cooled pieces in half. There should be no visible moisture and you should not be able to squeeze any moisture from the fruit. Some fruits may remain pliable, but are not sticky or tacky. If a piece is folded in half, it should not stick to itself. Berries should be dried until they rattle when shaken.

## Cooling Fruits

After drying completely, cool fruit 30 to 60 minutes before packaging. Avoid packaging warm food; this could lead to sweating and moisture build-up. However, excessive delay in packaging could also allow moisture to re-enter food.

## Post-Drying Treatment or Conditioning Fruits

When fruit is taken from the dehydrator, the remaining moisture may not be distributed evenly throughout the pieces of food because of the size of the pieces or where they were located in the dehydrator. Conditioning is a process used to equalize the moisture in the food. Conditioning is important because it reduces the risk of mold growth.

To condition the fruit, take the cool, dried fruit and pack it loosely in plastic or glass jars. Seal the containers and let them stand for 7 to 10 days. Shake or stir the contents of the container daily to separate the pieces and check for moisture condensation. If you notice any condensation, return the fruit to the dehydrator for additional drying. After conditioning, package and store the fruit according to the directions that follow.

## Packaging and Storage

All safe packaging material must be *food grade*. Approved by FDA as not containing or transferring chemicals hazardous to human health into food, *food grade* materials are clearly labeled for food use. These include glass canning jars, ceramic containers, plastic freezer bags, plastic freezer containers with tight lids, and freezer wraps of plastic, paper, or foil. Examples of containers not approved for food contact include trash bags and plastic or fiberboard containers that have previously held non-food materials.

It is important to package and seal dried foods properly to avoid insect infestation and moisture reabsorption. First, make sure the food has completely cooled and conditioned. If the food is packaged warm, sweating can occur which may provide enough moisture for mold growth. Pack foods into clean, food-grade packaging.

Dried foods should be stored in a dark, dry, cool place. Low temperatures extend the shelf life of the dried product. Most dried fruits can be stored for 1 year at 60°F, 6 months at 80°F.

## Vacuum Sealing

Vacuum sealing foods can increase the shelf life of some foods, but it is NOT a food preservation method by itself. If the food required refrigeration or freezing before vacuum sealing, it must still be kept refrigerated or frozen. Essentially vacuum sealing removes oxygen. Lower levels of oxygen helps reduce food spoilage. But on the other hand, oxygen reduction increases the risk of botulism, a potentially deadly foodborne illness caused by bacteria that grows best when oxygen is removed during vacuum sealing.

## Using Dried Fruit

Dried fruits can be eaten as is or reconstituted in water. Over-soaking produces a loss of flavor and can result in a mushy, water-logged texture. If fruit is soaked too long, fermentation can occur. Refrigerate the fruit if soaking time

**TABLE 1. Suitability of fruits for drying**

Fruit	Suitability for Drying	Suitability for Fruit Leather
Apples	Excellent	Excellent
Apricots	Excellent	Excellent
Avocados	Not recommended <sup>1</sup>	Not recommended
Bananas	Good	Fair to good
Berries w/seeds	Not recommended <sup>2</sup>	Excellent
Blueberries	Fair	Poor unless in combination
Cherries	Excellent	Excellent
Citrus fruits	Not recommended <sup>3</sup>	Only in combination
Citrus peel	Excellent	Only in combination
Crabapples	Not recommended <sup>4</sup>	Only in combination
Cranberries	Poor	Only in combination
Grapes	Excellent	Fair to good
Melons	Poor	Not recommended
Nectarines	Excellent	Excellent
Papayas	Good	Better in combination
Peaches	Excellent	Excellent
Pears	Excellent	Excellent
Persimmons	Fair	Not recommended
Pineapples	Excellent	Excellent
Plums	Good	Good
Pomegranates	Not recommended <sup>5</sup>	Not recommended
Prune plums	Excellent	Excellent
Rhubarb	Good <sup>6</sup>	Fair
Strawberries	Fair to good	Excellent

<sup>1</sup>High fat content; <sup>2</sup>High seed content and slow rate of drying; <sup>3</sup>Too juicy and pulp lacks firm texture; <sup>4</sup>Too small and tart; can be combined with other fruit for leather; <sup>5</sup>Pulp is full of seeds; <sup>6</sup>Never consume leaves – they contain toxic salts of oxalic acid.

is more than two hours. Thinly sliced fruits may not require soaking before being used in cooked dishes.

To cook reconstituted fruit, cover and simmer it in the soak water until tender. Remove from heat and cool, covered. Fruit may be sweetened at the end of the cooking time.

### Fruit Leather

Fruit leather is a popular type of dried fruit product that is tasty and chewy. See page 4, Table 1, for fruits that are suitable for making fruit leather.

Fruit leathers are made by pouring pureed fruit onto a flat surface for drying. When dried, the fruit is pulled from the surface and rolled. When pureed fruit is dried; it is shiny and has the texture of leather.

*Directions:* Select ripe or slightly overripe fruit and wash in cool water. Remove peel, seeds, and stem. Cut fruit into chunks and puree. Add 2 teaspoons of lemon juice or ½ teaspoon of ascorbic acid (375 mg) for each 2 cups of light colored fruit to prevent darkening. Fruit leather can be made from frozen or canned fruits. Drain liquid first. (Optional: To sweeten, add corn syrup, honey or sugar. Use ¼ to ½ cup for each 2 cups of fruit. Corn syrup and honey are best for longer storage.)

If drying fruit leather in a dehydrator, use plastic wrap or the specially designed plastic sheets that come with the dehydrator. For drying in the oven or sun, line cookie sheets with plastic wrap. Spray with cooking spray. Pour the leather onto the lined cookie sheets or tray. Spread it evenly to a thickness of ¼ inch.

Dry the fruit leather at 140°F until no indentation is left when touching the center with a finger. This could take about 6 to 8 hours in the dehydrator, up to 18 hours in the oven and 1 to 2 days in the sun. While still warm, peel from the plastic wrap. Cool, roll tightly, and rewrap in plastic and store.

### Acknowledgements

This revised MontGuide has been reviewed by Dr. Elizabeth Address, Director, National Center for Home Food Preservation, University of Georgia Extension Food Safety Specialist; Laurie Lutt, Big Horn County Extension agent, retired; and Kelly Moore, Missoula County Extension agent.



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File under: Nutrition and Health (Food Preservation)  
Revised May 2017 0515SA