



Drying Food at Home

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People have been preserving food through drying for thousands of years. Because dried food yields maximum quantity for the least volume, it has always been popular among hikers and campers. Dried food, however, is not just for people who enjoy the outdoors. Today, more and more people are eating dried food as a healthier snack alternative to candy and chips. Because dried food can be stored for long periods without spoilage, it makes good economic sense, too.

The principle behind drying is to deprive organisms such as bacteria, yeast, and mold of needed water and therefore prevent decay. Low humidity, warm temperatures (140° to 150°F), and air currents promote safe drying and produce a quality end product.

This publication discusses general techniques and guidelines for drying fruits and vegetables at home. Two tables are also provided which give information on drying particular fruits and vegetables.

Drying Methods

Sun Drying

This method is most successful in extremely sunny, arid climates where temperatures run 85°F or more, the humidity is less than 60 percent, and breezes are common. Kentucky's generally high humidity makes for poor sun drying. The following are things to remember when sun drying:

- Racks can be made using wooden slats attached to a frame or by using a screen made of nylon netting. Stainless steel, teflon-coated fiberglass, and plastic or propylene may be used as long as you are not going to dry **sulfured** fruit.
- Pretreat fruit to prevent browning and nutrient losses.

- Cover the loaded racks or screens with cheesecloth to keep out dust and insects.
- Place loaded racks and screens on blocks over a concrete surface or on a sheet of aluminum or tin. This allows for better air movement and light reflection. Be sure the racks are out of the reach of pets, wildlife, and rodents.
- Bring the food-covered racks indoors at night to avoid exposure to condensation from the night air.
- You will need to pasteurize food that has been dried in the sun (See page 5).

Vine Drying

This method is used for mature beans and peas such as limas, pintos, lentils, and black-eyed peas. Dry these in their pods on the vine until they rattle when shaken. The vines will be shriveled. Pick and shell the beans. Test for dryness (they should shatter when hit with a hammer). If the test beans are still moist, leave the rest on the vine to further dry them. You will need to pasteurize food that has been vine dried.

Microwave Drying

The microwave oven is not designed for drying fruits, vegetables, or meat. Some people have dried fresh herbs in the microwave, but doing so may result in a burned out magnetron or a fire. Read your manufacturer's directions for information concerning microwave drying.

Combination microwave/convection ovens use the convection cycle for drying. Again, read the manufacturer's instructions.

Oven Drying

Oven drying is a lengthy process that takes 2 to 3 times longer than an electric dehydrator. It also consumes more energy. If, however, you do not own a dehydrator, your kitchen oven can possibly be used to dry food. First, check your

oven: (a) Does it have a vent? All gas ovens and most (not all) electric ovens do. (b) What is the lowest heat setting? You will need 140°F. Very few newer ovens can be maintained below 200°F.

To determine the lowest setting place an oven thermometer in the rear of the oven. Prop the door open 4 inches. Set the oven thermostat for its lowest setting and place a fan out and to the side of the oven door. Run the fan so that the air current flows through the oven and out the other side. Monitor the oven thermometer's temperature reading. If the temperature runs greater than 160°F, you cannot use the oven. This heat will slow cook, not dry, the food.

Should your oven pass the test, you are ready to dry. Use open trays as discussed in the section on sun-drying. Be sure the trays are at least 1 1/2 inches narrower than the interior of the oven (for instance, if the interior of your oven is 26 inches wide and 24 inches deep, the drying rack should be no larger than 23 inches by 21 inches). Divide up to 6 pounds of food among 2 to 3 trays. Make sure the food is in single layers on the trays. Place the loaded trays into the oven. Allow 2 1/2 to 3 inches of room at the top of the oven. Proceed, setting the oven to maintain a temperature of 140°F. Be sure you prop the door open and set up a fan as discussed above. Remember to turn the food over approximately every half hour.

Dehydrator

There are two styles of dehydrators that differ in terms of where the heating element and fan are located. Foods closest to the heating element will experience warmer temperatures and dry faster unless you rotate them. If you are drying foods that have strong odors or that are sulfured, use the dehydrator in a well-ventilated area such as a breezeway or a screened-in porch.

Following these steps should help you get the most out of your dehydrator:

- Preheat the dryer to 150°F.
- Spray the trays with a vegetable spray to prevent sticking.
- Cut the food into uniform sizes and place on the trays in a single layer.

You may find it useful to weigh the loaded tray to help you later judge just how much

moisture has been removed from the fruit.

- Place the trays into the dehydrator and turn down the temperature to 140°F.
- If you are drying exceptionally juicy fruit such as grapes, blueberries, and plums, preheat the dryer to 120°F. After one hour of drying, raise the temperature to 130°F. Wait 30 minutes and raise it to 140°F. Slowly raising the temperature in this way will prevent case hardening and rupture of the fruit cell. In order to kill organisms using this technique, the fruit must be held at 140°F for more than half of the total drying time.

Preparing Fruit for Drying

Start with good quality fruit and always wash them before drying. Remove pits, stems, and stones and slice fruit into uniformly thin pieces for even drying.

Because fruits contain sugar they are more difficult to dry than vegetables. They take longer to dry and tend to be sticky. Reduce sticking by spraying the drying trays with a no-stick cooking spray and by removing foods from trays while still warm. For detailed instructions follow the directions that came with your dehydrator.

Pretreatment

Drying food does not improve its quality, but food will better maintain its quality if properly processed. Pretreatment improves the appearance of dried food (preserving color and flavor), wards off insects, and helps food retain vitamins A and C. Pretreating is not required, but it is advisable. There are a variety of pretreatments depending on the food you are drying and the type of pretreatment available where you live.

Anti-oxidants: A Temporary Measure

Once peeled or cut, fruits such as apples, apricots, peaches, pears, and nectarines quickly darken. Ascorbic acid (vitamin C) will prevent this browning. Soak cut fruit 3 to 5 minutes in a fruit juice (such as orange juice) that naturally contains vitamin C; then drain before drying.

Pure crystalline ascorbic acid (1/2 teaspoon per quart of water, as a quick dip) is available in drugstores. Other forms of ascorbic acid that may be available in supermarkets include powders (read directions) for "fresh cut fruits"

and vitamin C tablets (crush 500 milligram tablets and mix 1 teaspoon per quart of water). A citric acid product that contains ascorbic acid can be used in the ratio of 1 tablespoon per quart of water. Remember vitamin C is only a short-term measure. You may still want to follow up with sulfur, a sulfite dip, or steam blanching.

Checking

This procedure is also referred to as “cracking skins” and is used on fruits such as cherries, grapes, and blueberries that have a protective wax-like coating. Checking removes this waterproofing substance and cracks open the skin’s surface. This promotes drying and prevents rupturing of the fruit.

First, briefly (in and out) dip the fruit in briskly boiling water. Next, immediately immerse fruit in ice cold water for a few seconds. Drain fruit thoroughly and lay it on absorbent toweling. Continue with the next step for drying that particular fruit.

Sulfuring

This is the best long-term guarantee for preserving the color and flavor of dried fruit. Fruits that are typically sulfured include apples, apricots, peaches, and pears. Sulfuring requires an outdoor work area that is away from people, pets, trees, plants, and shrubs. **Do not** inhale sulfur fumes, and if you have an allergy to sulfur, **do not** eat sulfured fruits.

If you choose to sulfur, information on sulfur and instructions for constructing a sulfuring box may be obtained from your county Extension office.

Sulfite Dips

These offer an alternative to sulfuring, but they are not as effective nor are they without their problems. Soaking fruit may lead to waterlogging, nutrient losses, and uneven tissue penetration. Additionally, only food grade (USP) and pure (Reagent Grade) sulfite are recommended and these are not commonly available. Some drugstores and distributors of wine-making supplies might stock them.

Mix 1/4 teaspoon of the sulfite chemical into one quart of water. Soak the fruit 3 to 5 minutes. Drain, then dry as directed for that particular fruit. Follow the same precautions regarding fumes and allergies noted above with sulfur.

Blanching

Though not as effective as sulfuring, steam blanching is an optional treatment (see steam blanching vegetables, page 4) for fruit. Blanching also eliminates the safety concerns found with sulfur and sulfite dips.

Fruit Leathers

Leathers are pureed fruit dried in a thin sheet and usually eaten as a snack. Any single fruit is good. Fruit combinations are also delicious. Spices and sweeteners are optional.

Soft fruits need no cooking before pureeing. Firmer foods or those that darken when exposed to air should be cooked with 1 cup fruit juice per gallon prepared fruit to soften the food and destroy enzymes before pureeing. Use a blender, processor, or food mill to puree the fruit.

Spread purees 1/8 to 1/4-inch thick on plastic-lined cookie sheets or a special dehydrator tray. Dry at 120-135°F until the puree is leathery and separates easily from the plastic. Cool, roll jelly-roll fashion, and cut into segments as desired. Over-wrap in moisture/vapor proof freezer bags or aluminum foil.

Some fruits that are suitable for making leathers are apples, cherries, blueberries, grapes, peaches, pears, rhubarb, and strawberries.

Preparing Vegetables

Before treating or drying your vegetables, be sure to wash them in cool water to remove any chemical residue and soil. Cut vegetables into uniform sizes. Trim away decayed spots and bruises along with any woody materials. Core if so directed. Do not store prepared vegetables that you plan to use for drying because nutrients and product quality will deteriorate significantly during storage.

Pretreating

Blanching is primarily used for pretreating vegetables. It destroys enzymes and loosens the tissue. This sets the color and affords more rapid drying. Before drying a vegetable, read the guidelines for it (Table 2). There are two methods of blanching. You will need to know which process is recommended for your product. Some vegetables such as mushrooms, green peppers, and onions do not need to be blanched.

Water Blanching

Fill a large pot or dutch oven two-thirds full with water and bring to a rolling boil. Loosely fill a wire basket or colander with food. Submerge the basket, cover, and leave for the recommended amount of time. If the water does not return to a rolling boil within one minute, you have overfilled the basket. Test for doneness by cutting a sample in half; the center should be translucent.

Steam Blanching

You will need an extra large, deep pot for steaming. Loosely fill (no more than 2 1/2 inches deep) a wire basket with vegetables and place the basket in the pot. Be sure the basket sits **above** the water. Cover the pot. Steam for the recommended amount of time (Table 2). Test as you do for water blanching.

Cooling

This halts the cooking action started by blanching. Immediately dip the blanched vegetables into cold water. Leave the vegetables in the water until they feel slightly hot to the touch. Transfer the vegetables directly from the cool water onto the drying trays (limit to single layer) over the sink. Drain. Pat the underside with paper toweling and immediately place trays in the dehydrator.

Drying Herbs

Harvest herbs just before the buds are ready to open. The best time of day to pick them is in the morning immediately after the dew has evaporated and before the hot mid-day sun has wilted them. Rinse the herbs in cool water. Gently shake off the water. Then discard any bruised, soiled, or imperfect leaves and stems. Remove excess moisture by laying the herbs on paper towels. If you plan to tray-dry or use a dehydrator, transfer the seeds, leaves, and stems directly onto the trays. Do not pretreat herbs.

Air-Drying

The easiest way to dry herbs is to air-dry them in a well-ventilated area such as a breezeway or screened-in porch that draws good air currents. Herbs that have long stems may be tied at the stem end in small, loose bundles. Punch air holes in the sides of a

paper bag. Place a bundle in the bag and secure the open end of the bag around the stem end with a rubber band or string. Hang this end from overhead racks or hooks. Be sure the bundle is not close to a wall and that it is protected from evening dew and rain. Also, avoid direct sunlight to prevent bleaching out the color of the leaves.

You may want to tray-dry seeds and large-leaved herbs or herbs with short-tip stems. Simply spread the seeds or leaves on screens and cover with cheesecloth. Again, avoid exposure to direct sunlight and moisture. Stir or turn the herbs routinely (every 4 to 6 hours) until they are crispy dry (crumple between your thumb and fingers).

Dehydrator

It is not necessary to remove the stems or stalks before placing herbs in a dehydrator. Herbs are delicate and should be dried at a temperature of 105°F. Read the instructions for your dehydrator.

Microwave Oven

There is some debate as to the advisability of drying herbs in the microwave (see Microwave Drying). Read the manufacturer's directions for your particular model.

Determining Dryness

It is essential that the food be adequately dry to prevent the growth of microbes. Because you do not have the equipment necessary to measure water content, you will have to depend on the product's appearance, feel, and taste. Allow test pieces to cool before determining dryness.

Fruits: Cut in half. Squeezing shouldn't produce any wetness. The fruit should be pliable, springy, and non-sticky (except for cherries).

Fruit Leathers: These will be slightly sticky, but will easily peel away from plastic wrap.

Vegetables: Look for leathery to brittle texture depending on the vegetable. Leather-like ones will spring back when folded. Peas, corn, and mature beans will shatter when hit with a hammer.

Herbs: These will be brittle and crumple when you rub them between your fingers.

Conditioning

When fruit comes from the dehydrator some pieces will be under-dried and some will be over-dried depending on the thickness of the food and its location on the trays. Food that has been dried by any of the other methods may also vary in degree of dryness. To equalize moisture in dried fruit, loosely pack fruit in a closed glass jar for a week, shaking the jar once a day to separate and mix the pieces. If condensation develops in the jar the food is not dry enough and the drying process must be continued or the product will mold.

Test for dryness as described in the previous section. If some of the thicker pieces are not dry, sort and continue drying them while the dry pieces are placed in the conditioning jar. Most vegetables become very dry or brittle during the drying process and do not require conditioning. However, some such as sweet potatoes and tomatoes that are dried to a pliable stage should be conditioned to equalize moisture.

Pasteurizing

Sun or vine-dried foods must be pasteurized in order to kill insect larva which may be present. Food dried in a dehydrator or oven is already sufficiently heated to prevent insect infestation or kill insects that are already present. Use your oven for pasteurizing sun or vine-dried food. (Set up oven as described under Oven Drying.) Place a thermometer in the oven to check the temperature and time on each batch. Spread food in a single layer on shallow pans or cookie sheets. Heat 15 minutes at 175°F or 30 minutes at 160°F. Remove each batch of dried food and spread out to cool on clean dish towels. Package as soon as food is cool.

Packaging and Storing

Use clean insect- and moisture-proof plastic or glass containers. Canning jars with tight-fitting lids are a good choice. Metal cans may be used if the dried foods are first packaged in moisture/vapor-proof plastic bags. Dried foods will reabsorb moisture and spoil if they are not packaged well.

Dried foods will keep at room temperature for a year or longer, but there is gradual loss of

color, flavor, aroma, and nutritive value over time. Thus it is best to use dried food within a year.

Careful treatment and packaging of home-dried food will give you the best quality product.

Nutritional Value of Dried Foods

Fruits and vegetables are an important source of dietary fiber and drying does not alter the fiber content of the food. Dried fruits are a concentrated source of energy from naturally occurring sugar.

Vegetables and fruits are important sources of vitamins, especially A (beta carotene), C (ascorbic acid), and B vitamins such as folic acid and B₆. It is not known how much nutrient loss occurs in home-drying. With commercially-dried foods, nutrient losses occur during blanching and during drying. About 30 percent of the vitamin C in vegetables is lost during blanching. An additional 10 to 50 percent loss occurs during drying. Loss of vitamin A during drying varies from 10 to 20 percent. Similar losses occur in unsulfured fruits.

Compared with frozen or canned foods, dried foods have lower nutritive value. However, dried fruits are a concentrated source of fiber, energy, and minerals such as iron.

Using Dried Foods

Dried fruits make a delicious snack when eaten dry. Some vegetables such as zucchini and sweet potatoes also make tasty snacks. Most vegetables and fruits, however, are soaked in water and cooked to restore the moisture removed in drying. Usually, you can reconstitute dried foods by soaking them for 30 to 90 minutes in cold water. If boiling water is used, you can reduce soaking time to about 20 minutes. Use just enough water to cover the food and add more if needed.

Leafy green vegetables such as kale and spinach may be cooked in enough water to cover them without prior soaking.

Add dried vegetables directly to soups and stews to reconstitute and cook them.

Table 1: Guide to Drying Fruits

Fruit	Preparation	Pre-treatment	Drying Time in Dehydrator (hours)	Dryness Test
Apples	Peel (if desired) and core. Cut into slices or rings 1/8 to 1/4-inch thick. Slice into anti-darkening solution. Drain.	May be dried without any pre-treatment or steam blanch 3-5 minutes.	6-12	Soft, pliable.
Bananas	Peel and slice 1/4-inch thick in slices or lengths.	Fruit juice dip. Drain.	8-10	Pliable to crisp.
Berries*	Sort and wash carefully. Leave whole except halve or slice strawberries.	None	24-36	Leathery or crisp.
Cherries	Stem and remove pit. Cut in half or leave whole.	None	24-36	Shriveled, leathery. No moist center.
Citrus peel	Peels of grapefruit, lime, lemon and navel oranges. Use outer 1/8 inch of peel.	None	8-12	Crisp.
Grapes	Leave whole.	None	12-20	Raisin-like texture. No moist center.
Peaches	Peel if desired. Slice 3/8-inch thick. Drop into anti-darkening solution. For steam or water blanching, leave whole, then pit and cut.	Blanch 8 minutes in steam or boiling water (optional).	12-20	Soft, pliable.
Pears	Peel if desired. Cut in half. Core and slice into anti-darkening solution. Drain.	Steam blanch 6 minutes (optional).	8-16	Soft, pliable.
Persimmons	Peel and slice.	None	6-8	Pliable, not sticky.

(*Blackberries, raspberries, strawberries)

Table 2: Guide to Drying Vegetables

Vegetable	Preparation	Blanching Time (min.)	Steam Water	Drying Time in Dehydrator (hours)	Dryness Test
Beans, green	Wash and string, if necessary. Cut in 1-inch pieces.	2-2 1/2	2	8-14	Leathery, brittle.
Broccoli	Trim, cut as for serving. Wash. Quarter stalks lengthwise.	3-3 1/2	2	8-15	Crisp.
Carrots	Wash and peel. Cut in 1/8-inch thick coins or strips.	3-3 1/2	3 1/2	8-12	Tough to brittle.
Corn	Husk, trim. Blanch on cob until milk is set. Cut kernels off cob.	2-2 1/2	1 1/2	8-15	Brittle.
Legumes, dry, shelled	Vine dry. Shell and rinse. Pasteurize.	None		N/A	Hard, brittle; shatter when hit.
Legumes, mature	Harvest beans or peas when pods are mature and leathery, not dry. Shell and wash.	3	2	4-10 (start at 110° and gradually increase to 140°F)	Hard, brittle.
Onions	Wash, peel and slice into 1/8 to 1/4-inch thickness.	None		4-10	Brittle.
Peppers, green	Cut open. Remove seeds. Wash. Slice 1/4-inch thick strips or rings. May chop.	None		6-10	Leathery to brittle.
Potatoes, sweet and white	Wash, peel. Cut into shoestrings or rounds 1/8 to 1/4-inch thick.	6-8	5-6	8-12	Leathery to brittle.
Tomatoes, for stewing	Wash. Blanch. Peel and slice 3/8-inch thick. Cut small pear or plum tomatoes in half.	3	1	10-24	Leathery.

Sources of Information

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