



FOOD PRESERVATION

How to Dry Foods at Home

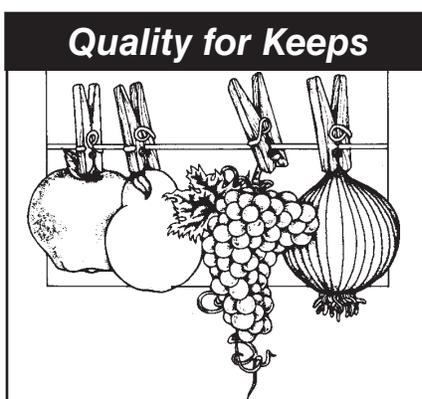
Nutritional Sciences
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Drying does not improve the quality of fruits or vegetables. Therefore it is important to choose produce of high quality and at the desired stage of ripeness. Before drying, produce should be sorted and that of inferior quality used in some other manner besides preserving. Follow directions for preparing and treating carefully, so that quality is maintained. For more information on drying foods, see MU publication GH1562, *Drying Foods*.

Fruits

Fruits should be ripe or just ready to eat for best quality when dried. Fruits with high water content, such as citrus fruits, are not suitable for drying. Do not use under-ripe produce. Fruits to be used in leathers can be overripe as long as they are not spoiled.

Prepare only as much food as you can dry at one time. Refer to Table 1 for notes on specific types of fruits. Wash fruit in cold running water to remove dirt, insect larvae and any surface microorganisms. Trim away bruises or soft spots. Remove stems, cores and pits. In some cases, skins should be removed because they will become tough or brittle when dried. (See Table 1.) Slice fruits uniformly, about 1/4 to 1/2 inch thick, for even



drying, shorter drying time, and more nutritious, better quality food.

Holding solutions

Prepare a holding solution when slicing large amounts of fruits that tend to brown. This step is not necessary if only a small amount of fruit is being prepared.

Use 1 tablespoon of pure, crystalline ascorbic acid or 1/4 teaspoon sodium bisulfite per quart of water. Or use a commercial antioxidant such as Fruit Fresh®; follow label directions for cut fruit. Hold fruit in solution no longer than one hour, because the fruit will absorb moisture and it will take longer for drying to be complete.

Pretreatments

Fruits such as apples, pears, peaches, nectarines and apricots require sulfur treatments to prevent

browning during the drying process. Sulfur treatments protect vitamins A and C during drying and storage, help retain fresh fruit flavor and increase the shelf life of the fruit. Sulfur treatments destroy thiamin, but most fruits are not good sources of thiamin, so this is not a great concern.

Two types of sulfur treatments are used — sulfuring and sulfite dips (sulfiting).

► **Sulfuring** is the most effective sulfur treatment and results in a minimal loss of water-soluble nutrients; however, it is not very practical. The fumes will irritate eyes and breathing passages, so it must be done outside. It is used primarily for fruits that are going to be sun dried, because sulfured fruits should not be dried inside. Sulfuring is more expensive, more time consuming and more complicated than using sulfite dips. Because sun drying is not a recommended procedure for Missouri, sulfuring is not recommended as an alternative for pre-treating fruits.

► **Sulfite dips** can be prepared and used in the kitchen and sulfite-dipped fruits can be dried indoors. There are several disadvantages of sulfite dips. Penetration of sulfite may be uneven, resulting in uneven color retention. The loss of water-

soluble nutrients is greater than in sulfured fruit. And, finally, the fruit may absorb water, which will result in a longer drying time.

Soaking times vary with the type of fruit and thickness of slices. (See Table 1 for specific fruits.) Dissolve $\frac{3}{4}$ teaspoon to $1\frac{1}{2}$ teaspoons sodium bisulfate per quart of water. (If using sodium sulfite, use $1\frac{1}{2}$ teaspoons to 3 teaspoons. If using sodium meta-bisulfite, use 1 tablespoon 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. (This solution can be used only once. Make a new one for the next batch.) These chemicals must be of food-grade quality and usually are available at wine-making supply stores, natural foods stores or pharmacies. Prices vary considerably.

Warning! Recent research indicates that certain asthmatics may react adversely to sulfites. Persons who are sensitive to sulfites should avoid preparing or eating sulfite-treated foods. Sulfite fumes will be given off during the drying process; also, if sodium bisulfite is added to water for steam-blanchings, fumes will escape with the steam.

Blanching

Syrup blanching

Blanching fruit in syrup helps it retain color fairly well during drying and storage. The resulting product is similar to candied fruit. Fruits that can be syrup blanched include: apples, apricots, figs, nectarines, peaches, pears, plums and prunes.

Combine 1 cup sugar, 1 cup light corn syrup and 2 cups water in a pot. Bring to a boil. Add 1 pound of prepared fruit and simmer 10 minutes.

Remove from heat and let fruit stand in hot syrup for 30 minutes. Lift fruit out of syrup, rinse lightly in cold water, drain on paper towels and place on dryer racks.

Steam blanching

Steam blanching also helps retain color and slow oxidation. However, the flavor and texture of the fruit are changed.

Place several inches of water in a large pot with a tight-fitting lid. Heat to boiling. Place fruit, not more than 2 inches deep, in a steamer pan or wire basket over boiling water. Cover tightly with lid and begin timing immediately. See Table 1 for blanching times. Check for even blanching halfway through the blanching time. Some fruit may need to be stirred. When done, remove excess moisture using paper towels and place on dryer trays.

Checking

Cherries, grapes and small, dark plums that are dried whole may require **a short heat treatment, called checking**, to remove a naturally occurring waxy coating and to crack the skins. Checking speeds up drying by allowing interior moisture to evaporate. If checking is not done, there is a greater chance of case hardening, which is the formation of a hard shell on the outside with moisture trapped within the fruit. This may occur more readily when fruit is dried in an oven rather than a dehydrator.

Fruit to be checked should be immersed in briskly boiling water for 30 to 60 seconds, then dunked in cold water and drained on paper towels. Treatment time depends on the thickness of skins. Checking can be done in a microwave oven by heating on high about 20 to 30 seconds, then chilling. Some flavor loss may result from the checking process.

Fruit leathers

A variety of fruits can be used for leathers. Some favorites include apples, apricots, bananas, peaches, pears and plums. They can be used singly or in combinations. Spices such as cinnamon, cloves, ginger, nutmeg and mint add extra flavor. Fruits are naturally sweet, so usually it is not necessary to add sweetener.

Making fruit leather is a snap

Use a blender or food processor to puree about 1 cup of fruit chunks at a time. To keep light-colored fruits from turning dark, add 2 teaspoons lemon juice or $\frac{1}{8}$ teaspoon ascorbic acid per 2 cups of fruit. Puree fruit.

Thicken juicy puree to shorten the drying time. Place pureed fruit in a deep, heavy saucepan and cook over low heat, stirring constantly, until mixture thickens. Remove from heat and cool.

To sweeten, use $\frac{1}{4}$ cup to $\frac{1}{2}$ cup corn syrup, honey or sugar for each 2 cups of fruit. Corn syrup or honey is best for longer storage because they prevent crystals. Sugar is fine for immediate use or short storage. Saccharin-based sweeteners could also be used to reduce tartness without adding calories. Aspartame sweeteners may lose sweetness during drying.

Drying concentrates flavors, making the fruit leather taste sweeter than the puree. For extra flavor, add $\frac{1}{4}$ teaspoon cinnamon or a dash of nutmeg per quart of puree.

Line dehydrator trays or cookie sheets (for oven drying) with plastic wrap. Tape plastic to tray on all four sides to keep it from blowing onto the leather. Pour pureed fruit onto plastic wrap and spread the puree by tilting the tray or cookie sheet to about $\frac{1}{8}$ inch thick. Leave a 1-inch border to

allow for spreading during drying.

Fruit puree may take six to 24 hours to dry. Leather is done when it has a leathery appearance and is pliable enough to roll up jelly-roll fashion. Test by separating leather from plastic wrap; if it separates easily it is done. Remove from tray and cool briefly. Place leather on clean plastic wrap and roll up, so plastic separates layers of leather.

Vegetables

Most vegetables need to be blanched before drying to stop enzyme activity. If enzymes are not destroyed, they will produce "off" flavors and the vegetables will turn brown during the drying process as well as during storage. Blanching kills some spoilage organisms, shortens the drying time of some foods and protects vitamins C and A during storage. But it also causes the loss of some water-soluble nutrients.

Blanching times vary with vegetables and thickness of slices. (See Table 2.) For boiling-water blanching, immerse no more than 1 pound of vegetables per gallon of boiling water.

Start blanching time as soon as the water returns to a boil. If it takes longer than one minute for the water to come back to boiling, too many vegetables were added. Reduce the amount in the next batch.

Dairy products and eggs

Caution! Milk, milk products and eggs are **not recommended** for home drying because of the high risk of food poisoning. Commercially dried milk and egg products are processed rapidly at temperatures high enough to prevent bacterial contamination. Home dryers cannot duplicate this process, and the safety of home-dried milk and

egg products cannot be guaranteed.

Meat jerky

Use lean cuts of meat such as flank or round steak. The leaner the meat, the better the product. Cut partially frozen meat into slices no thicker than ¼ inch. Uniform slices will shorten drying time.

The thickness of the meat strips will make a difference in the safety of the methods recommended. Trim and discard all fat from meat because it becomes rancid quickly. If a chewy jerky is desired, slice with the grain. Slice across the grain if a tenderer, brittle jerky is preferred. A tenderizer can be used according to package directions, if desired. The meat can be marinated for flavor and tenderness. Marinade recipes may include oil, salt, spices and acid ingredients such as vinegar, lemon juice, teriyaki, or soy sauce or wine.

Jerky Marinade

1½ pounds to 2 pounds lean meat
(beef, pork or venison)
¼ cup soy sauce
1 tablespoon Worcestershire sauce
¼ teaspoon black pepper
¼ teaspoon garlic powder
½ teaspoon onion powder
1 teaspoon hickory smoke flavored salt

Combine all ingredients. Place strips of meat in a shallow pan and cover with marinade. Cover and refrigerate 1 hour to 2 hours, or overnight. Products marinated for several hours may be more salty than some people prefer. If you choose to heat the meat prior to drying, to decrease the risk of foodborne illness, do so at the end of the marinating time. To heat, bring strips and marinade to a boil and boil for 5 minutes before draining and

drying. If strips are more than ¼ inch thick, the length of time may need to be increased.

Remove meat strips from the marinade and drain on clean, absorbent towels. Arrange strips on dehydrator trays (or cake racks placed on baking sheets for oven drying). Place the slices close together, but not touching or overlapping. Place the racks in a dehydrator or oven preheated to 140 degrees F. Dry until a test piece cracks but does not break when it is bent (10 hours to 24 hours for samples not heated in marinade). Samples heated in marinade will dry faster. Begin checking samples after 3 hours. Once drying is completed, pat off any beads of oil with clean, absorbent towels and cool. Remove strips from the racks. Cool. Package in glass jars or heavy plastic food storage bags. Vacuum packaging is also a good option.

If the strips were not heated in marinade prior to drying, they can be heated in an oven after drying as an added safety measure. Place strips on a baking sheet, close together, but not touching or overlapping. For strips originally cut ¼ inch thick or less, heat 10 minutes in an oven preheated to 275 degrees F.

Table 1. A guide to home drying of fruits

For portable dehydrators, set temperature at 140 degrees F for best results.

Fruit	Preparation	Pretreatment				Dehydrator drying time* (hours)	Test for dryness (cool before testing)
		Blanch					
		Sulfite dip (minutes)	Steam (minutes)	Syrup (minutes)	Other		
Apples	Peel and core, cut into slices or rings about 1/8 inch thick	Sulfite 5 min.	3–5 min., depending on texture	10 min.		6–12 hours	Soft, pliable, no moist area in center when cut
Apricots	Pit and halve. May slice, if desired.	Sulfite 5 min.	3–4 min.	10 min.		24–36 hours	Same as for apples
Bananas	Use solid yellow or slightly brown-flecked bananas. Avoid bruised or overripe bananas. Peel and slice 1/4 inch to 3/8 inch thick, crosswise or lengthwise.	None	3–4 min.	10 min.	Dip into mixture of lemon juice (1 T), honey (1/4 cup), and water (1/4 cup) or ascorbic acid or pineapple juice. Pretreat if a lighter color is desired.	8–10 hours	Pliable to crisp
Berries							
Firm: Suitable for snacks or cooking	Wash and drain berries with waxy coating (blueberries, cranberries, currants, gooseberries, huckleberries).				Plunge into boiling water 15–30 seconds. Stop cooking action by placing fruit in ice water. Drain on paper towels.	24–36 hours	Leathery and pliable with no moisture
Soft: Not a superior product	Boysenberries, strawberries. Sort and wash carefully.				No treatment is necessary.	24–36 hours	Dry and leathery or crisp
Cherries	Stem, wash, drain and pit fully ripe cherries. Cut in half, chop or leave whole.				Whole: Dip in boiling water 30 seconds to crack skin (10 sec. for sour cherries). Cut and pitted: No treatment is necessary.	24–36 hours	Shriveled, leathery, dry, no pockets of moisture.
Citrus peel	Peels of citron, grapefruit, kumquat, lime, lemon, tangelo and tangerine can be dried. Thick-skinned navel orange peel dries better than thin-skinned Valencia peel. Wash thoroughly.	None			No pretreatment. Remove outer 1/8 inch of peel. Avoid white bitter pith.	8–12 hours	Crisp
Grapes		No treatment is necessary.				12–20 hours	Raisinlike texture, no moist center
Seedless:	Leave whole.				Whole: Dip in boiling water 30 sec. or more to check skins. Plunge in ice water to stop cooking. Drain on paper towels.		
With seeds:	Cut in half and remove seeds.						

Fruit	Preparation	Pretreatment				Dehydrator drying time* (hours)	Test for dryness (cool before testing)
		Blanch					
		Sulfite dip (minutes)	Steam (minutes)	Syrup (minutes)	Other		
Nectarines and peaches	When sulfiting, pit and halve; if desired, remove skins. For steam and syrup blanching, leave whole, then pit and halve. May also be sliced or quartered.	5–15 min.	8 min.	10 min.		36–48 hours	Same as for apples
Pears	Cut in half and core. Removing peel is preferred.	5 min.	6 min. (will be soft if peeled)			24–36 hours	Same as for apples
Pineapple	Use fully ripe, fresh pineapple. Wash, peel and remove thorny eyes. Slice lengthwise and remove core. Cut in ½-inch slices, crosswise.	No treatment is necessary.				24–36 hours	Leathery but not sticky.
Plums (prunes)	Leave whole.				Dip in boiling water 30 sec. or more to check skin.	24–36 hours	Leathery; pit should not slip when squeezed if prune is not cut.

*A dehydrator is suggested rather than an oven because of time needed to dry fruits (especially those in large pieces). Range ovens can be used, but time and fuel expense will be great for the amount dried. Apples are the only fruit practical to dry in large pieces in the home oven.

Drying times depend on initial moisture content of the product and the particular dehydrator being used.

Table 2. A guide to home drying of vegetables

For portable dehydrators, set temperature at 140 degrees F for best results.

Vegetable	Preparation	Blanching time (minutes)		Dehydrator drying time* (hours)	Characteristics
		Steam	Water		
Beans, green	Wash thoroughly. Cut in short pieces or lengthwise.	2–2½ min.	2 min.	8–14 hours	Leathery, brittle
Beets	Cook as usual. Cool; peel. Cut into shoestring strips ⅛ inch thick.	Already cooked. No further blanching is required.		10–12 hours	Brittle
Broccoli	Trim; cut as for serving. Wash thoroughly. Quarter stalks lengthwise.	3–3½ min.	2 min.	12–15 hours	Crisp
Brussels sprouts	Cut in half lengthwise through stem.	6–7 min.	4½–5½ min.	12–18 hours	Tough to brittle
Cabbage	Remove outer leaves; quarter and core. Cut into strips ⅛ inch thick.	2½–3 min.**	1½–2 min.	10–12 hours	Brittle
Carrots	Use only crisp, tender carrots. Wash thoroughly. Cut off roots and tops; peel, cut in slices or strips ⅛ inch thick.	3–3½ min.	3½ min.	10–12 hours	Tough to brittle
Cauliflower	Prepare as for serving.	4–5 min.	3–4 min.	12–15 hours	Crisp
Celery	Trim stalks. Wash stalks and leaves thoroughly. Slice stalks.	2 min.	2 min.	10–16 hours	Very brittle

Vegetable	Preparation	Blanching time (minutes)		Dehydrator drying time* (hours)	Characteristics
		Steam	Water		
Corn, cut	Husk, trim cobs. Cut kernels from the cob after blanching.	Blanch cobs 2–2½ min.	1½ min.	6–8 hours	Dry, brittle
Eggplant	Use the same directions as for summer squash.	3½ min.	3 min.	12–14 hours	Leathery
Horseradish	Wash; remove small rootlets and stubs. Peel or scrape roots. Grate.	None	None	6–8 hours	Brittle
Mushrooms*** WARNING! (see below)	Scrub thoroughly. Discard any tough, woody stalks. Cut tender stalks into short sections. Do not peel small mushrooms or "buttons." Peel large mushrooms, slice.	None	None	8–10 hours	Leathery
Okra	Wash, trim, slice crosswise in ⅛-inch-¼-inch disks.	None	None	8–10 hours	Very brittle
Onions	Wash, remove outer "paper shells." Remove tops and root ends, slice ⅛ inch-¼ inch thick.	None	None	3–9 hours	Brittle
Parsley	Wash thoroughly. Separate clusters. Discard long or tough stems.	None	None	1–2 hours	Brittle, hard
Peas	Shell.	3 min.	2 min.	8–10 hours	Wrinkled, green
Peppers and pimientos	Wash, stem, core. Remove "partitions." Cut into strips, slice or dice.	None	None	8–12 hours	Leathery to brittle
Potatoes	Wash, peel. Cut into shoestring strips ¼ inch thick, or cut in slices ⅛ inch thick.	6–8 min.	5–6 min.	8–12 hours	Brittle
Spinach and other greens (kale, chard, mustard)	Trim, wash thoroughly.	2–2½ min.	1½ min.	8–10 hours	Crisp
Squash					
Hubbard:	Cut or break into pieces. Remove seeds and cavity pulp. Cut into 1-inch-wide strips. Peel rind. Cut strips crosswise into pieces about ⅛ inch thick.	2½–3 min.	1 min.	10–16 hours	Tough to brittle
Summer:	Wash, trim, cut into ¼-inch slices.	2½–3 min.	½ min.	10–12 hours	Leathery to brittle
Tomatoes, for stewing	Steam or dip in boiling water to loosen skins. chill in cold water. Peel. Cut into sections about ¾ inch wide, or slice. Cut small pear or plum tomatoes in half.	3 min.	1 min.	10–18 hours	Leathery

*Drying times depend on initial moisture content of the product and the particular dehydrator being used. Drying times in a conventional oven could be up to twice as long, depending on air circulation.

**Steam until wilted.

*****WARNING!** The toxins of poisonous varieties of mushrooms are NOT destroyed by drying or cooking. Only an expert can differentiate between poisonous and edible varieties.

For more information, visit MU Extension:

<http://extension.missouri.edu>