

How to Dehydrate Foods

Dehydrating does not improve the quality of fruits or vegetables.

Therefore, when selecting produce to dry, be sure it is of high quality and at the desired stage of ripeness. Before drying produce, sort it; use that of inferior quality in a manner other than preserving. Carefully follow directions for preparing and treating produce to maintain quality. For more information on drying foods, see MU Extension publication GH1562, *Introducing Food Dehydration*.

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 underripe 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 (Table 1). Slice fruits uniformly, about ¼ to ½ inch thick, for even drying, shorter drying time and more nutritious, better-quality food.

Holding solutions

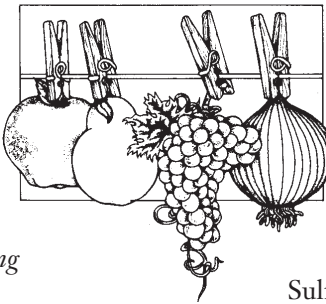
Prepare a holding solution when slicing large amounts of fruits that tend to brown. This step is not necessary if only a small amount of fruit is being prepared.

Use 1½ tablespoons of pure, crystalline ascorbic acid 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 an hour because the fruit will absorb moisture and take longer to dry.

Pretreatments

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

Quality for Keeps



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 dipping, or sulfiting.

Sulfuring

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 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 pretreating fruits.

Sulfiting

Sulfite dips can be prepared and used in the kitchen, and sulfite-dipped fruits can be dried indoors. However, sulfite dips have several disadvantages. 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 (Table 1). Dissolve ¾ to 1½ teaspoons sodium bisulfate per quart of water. (If using sodium sulfite, use 1½ to 3 teaspoons. If using sodium metabisulfite, 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. (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 winemaking supply stores, natural foods stores, and pharmacies. Prices vary considerably.

Table 1. A guide to home drying fruits for portable dehydrators with temperature set to 140 degrees F.

Fruit	Preparation	Pretreatment				Dehydrator drying time ^a (hours)	Test for dryness (cool before testing)
		Sulfite dip (minutes)	Blanch		Other		
			Steam (minutes)	Syrup (minutes)			
Apples	Peel and core, cut into slices or rings about 1/8 inch thick.	5	3–5, depending on texture	10	None	6–12	Soft, pliable, no moist area in center when cut
Apricots	Pit and halve; may slice if desired.	5	3–4	10	None	24–36	Soft, pliable, no moist area in center when cut
Bananas	Use solid yellow or slightly brown-flecked bananas; avoid bruised or overripe bananas; peel and slice 1/4 to 3/8 inch thick, crosswise or lengthwise.	None	3–4	10	Dip into mixture of lemon juice (1 tablespoon), honey (1/4 cup), and water (1/4 cup), or ascorbic acid or pineapple juice; pretreat if a lighter color is desired.	8–10	Pliable to crisp
Firm berries, suitable for snacks or cooking	Wash and drain berries with waxy coating (blueberries, cranberries, currants, gooseberries, huckleberries).	No treatment necessary			Plunge into boiling water 15–30 seconds; stop cooking action by placing fruit in ice water; drain on paper towels.	24–36	Dry and leathery or crisp
Soft berries, not a superior product	Boysenberries, strawberries. Sort and wash carefully.	No treatment necessary				24–36	Dry and leathery or crisp
Cherries	Stem, wash, drain and pit fully ripe cherries; cut in half, chop, or leave whole.	No treatment necessary			Whole: Dip in boiling water 30 seconds to crack skin (10 seconds for sour cherries). Cut and pitted: No treatment necessary.	24–36	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.	No treatment necessary			Remove outer 1/8 inch of peel; avoid white bitter pith.	8–12	Crisp
Grapes, seedless	Leave whole.	No treatment necessary			Dip in boiling water for 30 seconds or more to check skins; plunge in ice water to stop cooking; drain on paper towels.	12–20	Raisinlike texture, no moist center
Grapes with seeds	Cut in half and remove seeds.	No treatment necessary			None	12–20	Raisinlike texture, no moist center
Nectarines and peaches	When sulfiting, pit and halve; if desired, remove skins; for steam and syrup blanching, leave whole, and then pit and halve; may also be sliced or quartered.	5–15	8	10	None	36–48	Soft, pliable, no moist area in center when cut
Pears	Cut in half and core. Removing peel is preferred.	5	6 (will be soft if peeled)	24–36 hours	None		Soft, pliable, no moist area in center when cut

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(continued)

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		Sulfite dip (minutes)	Blanch		Other			
			Steam (minutes)	Syrup (minutes)				
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 necessary				None	24–36	Leathery but not sticky
Plums (prunes)	Leave whole.	No treatment necessary				Dip in boiling water 30 seconds or more to check skin.	24–36	Leathery; pit should not slip when squeezed if prune is not cut

^a 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 a home oven.

Warning

Recent research indicates that certain people with asthma may react adversely to sulfites. People 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.

Ascorbic acid mixtures

Ascorbic acid mixtures are a mixture of ascorbic acid and sugar, sold for use on fresh fruits and in canning or freezing. They are more expensive and not as effective as using pure ascorbic acid.

Directions for use: Mix 1½ tablespoons of ascorbic acid mixture with 1 quart of water. Place the fruit in the mixture, and soak for 3 to 5 minutes. Drain the fruit well, and place on dryer trays. After this solution is used twice, add more ascorbic acid mixture.

Honey dip

Many store-bought dried fruits have been dipped in a honey solution. A similar dip can be made at home. Honey-dipped fruit is much higher in calories.

Directions for use: Mix 1½ cup sugar with 1½ cups boiling water. Cool until lukewarm, and add ½ cup honey. Place fruit in dip, and soak for 3 to 5 minutes. Remove fruit, drain well and place on dryer trays.

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; 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, it changes the flavor and texture of the fruit.

Place several inches of water in a large pot with a tight-fitting lid. Heat to boiling. Place fruit, no more than 2 inches deep, in a steamer pan or wire basket over the 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 crack the skins and to remove a naturally occurring waxy coating. 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. Case hardening 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 and 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, and 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 it is usually unnecessary 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 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 1/4 to 1/2 cup corn syrup, honey or sugar for each 2 cups of fruit. Corn syrup or honey is best for longer storage because both 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 1/4 teaspoon cinnamon or a dash of nutmeg per quart of puree.

To dry fruit in an electric dehydrator, line the plastic dryer trays with liners designed especially for that purpose or with plastic wrap. Be careful not to allow leakage.

For drying in the oven, a 13-by-15-inch cookie pan with short raised edges works well. Line the pan with a nonstick material, being careful to smooth out wrinkles. Electric dryer tray liners that can be cut to fit your pan, available from several online sources, can be used. Silicone nonstick baking mats can also be used to line the cookie pan. Do not use waxed paper or aluminum foil.

Fruit leathers can be poured into a single large pan (13-by-15 inches) or into several smaller pans. Spread puree evenly, about 1/8 inch thick, onto a drying tray. Avoid pouring puree too close to the edge of the pan. Larger fruit leathers take longer to dry. Approximate drying times are 6 to 8 hours in a dehydrator, up to 18 hours in an oven, and 1 to 2 days in the sun.

Dry fruit leathers at 140 degrees F. Leather dries from the outside edge toward the center. Test for dryness by touching the center of the leather; no indentation should be evident. While leathers are warm, peel from plastic and roll. Allow to cool, and rewrap the roll in plastic. Cookie cutters can be used to cut out shapes that children will enjoy. Roll, and wrap in plastic.

Chances are the fruit leather will not last long enough for storage. If it does, it will keep up to 1 month at room temperature. For storage up to 1 year, place tightly wrapped rolls in the freezer.

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. Blanching also causes the loss of some water-soluble nutrients.

Blanching times vary with vegetables and thickness of slices (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 1 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

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 1/4 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

For 1 1/2 to 2 pounds lean meat (beef, pork or venison):
1/4 cup soy sauce
1 tablespoon Worcestershire sauce
1/4 teaspoon black pepper
1/4 teaspoon garlic powder
1/2 teaspoon onion powder
1 teaspoon hickory smoke flavored salt

Table 2. A guide to home drying vegetables.

Vegetable	Preparation	Blanching time (minutes)		Dehydrator drying time ^a (hours)	Characteristics
		Steam	Water		
Beans, green	Wash thoroughly. Cut in short pieces or lengthwise.	2–2½	2	8–14	Leathery, brittle
Beets	Cook as usual. Cool; peel. Cut into shoestring strips ½ inch thick.	Already cooked. No further blanching is required.		10–12	Brittle
Broccoli	Trim; cut as for serving. Wash thoroughly. Quarter stalks lengthwise.	3–3½	2	12–15	Crisp
Cabbage	Remove outer leaves; quarter and core. Cut into strips ½ inch thick.	2½–3 ^b	1½–2	10–12	Brittle
Carrots	Use only crisp, tender carrots. Wash thoroughly. Cut off roots and tops; peel; cut in slices or strips ½ inch thick.	3–3½	3½	10–12	Tough to brittle
Cauliflower	Prepare as for serving.	4–5	3–4	12–15	Crisp
Celery	Trim stalks. Wash stalks and leaves thoroughly. Slice stalks.	2	2	10–16	Very brittle
Corn, cut	Husk, trim cobs. Blanch cobs. Cut kernels from the cob after blanching.	2–2½	1½	6–8	Dry, brittle
Eggplant	Use the same directions as for summer squash.	3½	3	12–14	Leathery
Horseradish	Wash; remove small rootlets and stubs. Peel or scrape roots. Grate.	None	None	6–8	Brittle
Mushrooms ^c	Scrub thoroughly. Discard any tough, woody stalks. Cut tender stalks into short sections. Do not peel small mushrooms or “buttons.” Peel and slice large mushrooms.	None	None	8–10	Leathery
Okra	Wash, trim, slice crosswise in ⅛- to ¼-inch disks.	None	None	8–10	Very brittle
Onions	Wash. Remove outer “paper shells,” tops and root ends. Slice ⅛ to ¼ inch thick.	None	None	3–9	Brittle
Parsley	Wash thoroughly. Separate clusters. Discard long or tough stems.	None	None	1–2	Brittle, hard
Peas	Shell.	3	2	8–10	Wrinkled, green
Peppers and pimientos	Wash, stem, and core. Remove “partitions.” Cut into strips, slice or dice.	None	None	8–12	Leathery to brittle
Potatoes	Wash; peel. Cut into shoestring strips ¼ inch thick or slices ½ inch thick.	6–8	5–6	8–12	Brittle
Spinach and other greens (kale, chard, mustard)	Trim; wash thoroughly.	2–2½	1	8–10	Crisp
Hubbard squash	Cut or break into pieces. Remove seeds and cavity pulp. Cut into 1-inch-wide strips. Peel rind. Cut strips crosswise into pieces about ½ inch thick.	2½–3	1	10–16	Tough to brittle
Summer squash	Wash, trim, and cut into ¼-inch slices.	2½–3	½	10–12	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	1	10–18	Leathery
Tomatoes, sliced	Wash, remove core, and cut crosswise into ¼- to ¾-inch slices. No peeling or blanching is necessary. Slices can be lightly sprinkled with crumbled dry oregano or other dry herbs of your choice before drying.	None	None	6–12	Leathery to brittle

^a 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.

^b Steam until wilted.

^c **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.

Combine all ingredients. Place strips of meat in a shallow pan, and cover with marinade. Cover and refrigerate 1 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 before drying, do so at the end of the marinating time to decrease the risk of foodborne illness. To heat, bring strips and marinade to a boil. Boil for 5 minutes, drain and dry. 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 on cake racks placed on baking sheets for oven drying. Place the strips 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. Samples not heated in marinade may take 10 to 24 hours to dry; 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-duty plastic food storage bags. Vacuum packaging is also a good option.

If the strips were not heated in marinade before 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.

References

White, Athalie, Ann Ford, Elizabeth L. Address, and Judy A. Harrison. 2014. *So Easy To Preserve*, 6th ed. University of Georgia Cooperative Extension Service.

ALSO FROM MU EXTENSION PUBLICATIONS

- GH1501 *Quality for Keeps: Freezing Basics*
- GH1502 *How to Freeze Fruits*
- GH1503 *Quality for Keeps: Freezing Vegetables*
- GH1504 *Quality for Keeps: Freezing Meat, Poultry, Fish, Eggs and Dairy Products*
- GH1505 *Quality for Keeps: Freezing Home-Prepared Foods*
- GH1506 *Quality for Keeps: Freezer Problem Solver*
- GH1507 *Quality for Keeps: Freezing Unusual Fruits and Vegetables*

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