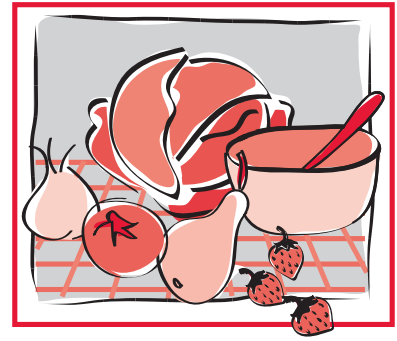


Drying Fruits

Fact Sheet No. 9.309

Food and Nutrition Series | Preparation



by P. Kendall and J. Sofos*

Drying is a creative way to preserve foods and use home-grown fruit, extra produce (e.g., ripe bananas) and farmers' market specials. Like all methods of preservation, drying causes some nutrient loss. Nutritional changes that occur during drying include:

Calorie content: does not change, but is concentrated into a smaller mass as moisture is removed.

Fiber: no change.

Vitamin A: fairly well retained under controlled heat methods.

Vitamin C: pretreatment with ascorbic acid or lemon juices enhances levels of vitamin C, though loss will occur during drying.

Thiamin, riboflavin, niacin: fairly good retention.

Minerals: fairly good retention.

For best retention of nutrients in dried foods, store in a cool, dark, dry place and use within a year.

Selecting and Pretreating Fruits

Select fresh and fully ripened fruits. Immature produce lacks flavor and color. Overmature produce can be tough and fibrous or soft and mushy. Drying does not improve food quality. See Table 1 for approximate yields of dried fruits.

Thoroughly wash and clean fruits to remove dirt. Sort and discard any fruit that shows decay, bruises, or mold. Such defects can affect all foods being dried.

Pretreating fruits prior to drying is highly recommended. Pretreating helps keep light-colored fruits from darkening during drying and storage and it speeds the drying of fruits with tough skins, such as grapes and cherries. Research studies have shown that pretreating with an acidic solution or sodium metabisulfite dip also enhances the destruction of potentially harmful bacteria during drying, including *Escherichia coli* O157:H7, *Salmonella* species and *Listeria monocytogenes*. Several methods can be used.

Ascorbic Acid Pretreatment

Ascorbic acid (vitamin C) is an antioxidant that keeps fruit from darkening and enhances destruction of bacteria during drying. Pure crystals usually are available at supermarkets and drug stores. Stir 2 1/2 tablespoons (34 grams) of pure ascorbic acid crystals into one quart (1000 milliliters) of cold water. For smaller batches prepare a solution using 3 3/4 teaspoons (17 grams) of pure ascorbic acid crystals per 2 cups of cold water. Vitamin C tablets can be crushed and used (six 500 milligram tablets equal 1 teaspoon ascorbic acid). One quart of solution treats about 10 quarts of cut fruit. Cut peeled fruit directly into ascorbic acid solution. Soak for 10 minutes, remove with a slotted spoon, drain well and dehydrate. Commercial antioxidant mixtures are not as effective as ascorbic acid but are more readily available in grocery stores. Follow directions on the container for fresh cut fruit.

Citric Acid or Lemon Juice Pretreatment

Citric acid or lemon juice may also be used as antidarkening and antimicrobial pretreatments. Prepare the citric acid solution by stirring 1 teaspoon (5 grams) of citric acid into one quart (1000

Quick Facts

- Successful drying depends on heat, air dryness and good air circulation.
- Select fresh, fully-ripened fruits.
- Pretreat fruit pieces by dipping in an ascorbic acid, citric acid, lemon juice or sodium metabisulfite solution.
- When dry, allow fruit to condition for 4 to 10 days before packaging for storage.
- Package dried fruits in tightly sealed containers and store in a cool, dry place.

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Table 1. Yield of dried fruits.

Produce	Amount purchased	Amount dried product	
	or picked 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

milliliters) of cold water. For the lemon juice solution, mix equal parts of lemon juice and cold water (i.e., 1 cup lemon juice and 1 cup water). Cut the peeled fruit directly into the citric acid or lemon juice solution. Allow to soak 10 minutes, then remove with a slotted spoon, drain well and dehydrate. Citric acid is often available in the canning section of the supermarket.

Sodium Metabisulfite Pretreatment

Sulfur and sulfite compounds have been used for centuries to prevent discoloration and reduce spoilage during the preparation, dehydration, storage, and distribution of many foods. However, sulfites may initiate asthmatic reactions in some people, especially those with asthma. As a result, the Food and Drug Administration (FDA) has banned the use of sulfites on fresh fruits and vegetables for sale or served raw to consumers. They are still used as an antimicrobial agent and to help preserve the color of some dried fruit products.

If you choose to use a sulfiting agent, use U.S.P. (food grade) or Reagent Grade sodium metabisulfite, not Practical Grade. Sodium metabisulfite is often available at pharmacies or where wine-making supplies are sold. Stir 1 tablespoon (21 grams) sodium metabisulfite into one quart (1000 milliliters) of cold water. Cut the peeled fruit directly into the sodium metabisulfite solution. Allow to soak 10 minutes, then remove with a slotted spoon, drain well and dehydrate. Due to health and safety concerns, do not use burning sulfur to pretreat fruits for drying.

Caution: Pretreating with sodium metabisulfite is not recommended if you or others who will be consuming the dried fruit have known sulfite sensitivity.

Cracking Skins

Fruits such as grapes, prunes, small dark plums, cherries, figs, and firm berries have tough skins with a wax-like coating. To allow inside moisture to evaporate, crack or “check” skins before drying whole fruits. To crack skins, dip fruit in briskly boiling water for 30 to 60 seconds, then dip in very cold water. Drain on absorbent towels before placing on drying trays.

Drying Trays

Drying trays can be simple or complex, purchased or built. Good air circulation without reaction between food and trays is most important. For small amounts of food and trial runs, cheesecloth or synthetic curtain netting stretched over oven racks, cake racks, broiler racks or cookie sheets work well. Attach with clothes pins. For large quantities of food, use shallow wooden or plastic trays with slatted, perforated or woven bottoms.

If preparing your own trays, do not use galvanized screening for tray bottoms. It has been treated with zinc and cadmium, which can cause a harmful reaction when in contact with acid foods. Other metals such as aluminum also are not advisable because they may discolor and corrode with use. If used, line with cheesecloth or synthetic curtain netting to keep food from touching the metal. A liner also helps keep foods from sticking to trays and prevents pieces of food from falling through.

Wash trays in hot, sudsy water with a stiff brush. Rinse in clear water and air dry thoroughly before and after each use. A light coat of fresh vegetable oil or nonstick substance helps protect wood slats and makes cleaning easier.

If trays are used in an oven, they should be 1 1/2 inches smaller in length

and width than the oven dimensions to allow for good air circulation. When stacking trays, place blocks of wood 2 inches or higher between trays.

Drying Methods

Arrange pretreated fruits on drying trays in single layers, pit cavity up. Dry at 140 degrees F (60°C) in an oven or dehydrator. The length of time needed to dry fruits will depend on the size of the pieces being dried, humidity and the amount of air circulation in the dehydrator or oven. Thinner slices and smaller pieces will dry more quickly than larger, thicker pieces or whole fruits. Also, products will generally dry more quickly in convection ovens or electric dehydrators than in conventional ovens. At a drying temperature of 140 degrees F, plan on about 6 hours for thin apple slices to 36 hours for peach halves. If possible, stir food and turn large pieces over every 3 to 4 hours during the drying period. Fruits scorch easily toward the end of drying. Therefore, it's best to turn the power off when drying is almost complete and open the door wide for an additional hour before removing pieces.

Testing for Dryness

Dry fruits enough to prevent microbial growth and subsequent spoilage. Dried fruits should be leathery and pliable. See Table 2 for dryness test on individual fruits. To test foods for dryness, remove a few pieces and let cool to room temperature. When warm or hot, fruits seem more soft, moist and pliable than they actually are. Squeeze a handful of the fruit. If no moisture is left on the hand and pieces spring apart when released, they are dry.

Post-Drying Treatment

Conditioning. When drying is complete, some pieces will be moister than others due to their size and placement during drying. Conditioning is a process used to evenly distribute the minimal residual moisture throughout all pieces. This reduces the chance of spoilage, especially from

mold. To condition, place cooled, dried fruit loosely in large plastic or glass containers, about two-thirds full. Lightly cover and store in a warm, dry, well-ventilated place for four to 10 days. Stir or shake containers daily to separate pieces. If beads of moisture form inside, return food to drying trays for further drying, then repeat the conditioning step.

Packaging and Storage

After conditioning, pack cooled, dried foods in small amounts in dry, scalded glass jars (preferably dark) or in moisture- and vaporproof freezer containers, boxes or bags. Label packages with name of product, date and method of pretreatment and drying. Tightly seal containers to prevent reabsorption of moisture or entry of insects. Store in a cool, dry, dark place or in the refrigerator or freezer. Properly stored, dried fruits keep well for six to 12 months. Discard foods that have off odors or show signs of mold.

Using Dried Fruits

Dried fruits are a great snack, being convenient and easy to pack no matter the season or activity. Dried fruits can also be added to granola or hot cereals, salads, pilafs, meat dishes and much more.

To cook dried fruit, cover with boiling water and simmer covered until tender (about 15 minutes). If needed, sweeten to taste near the end of cooking or after removing from heat. Most

dried fruits need no extra sweetening. If desired, add a few grains of salt to help bring out the fruit's natural sweetness, or add a little lemon, orange or grapefruit juice just before serving. This helps give fruits a fresh flavor and adds vitamin C.

To reconstitute fruit for use in a cooked dish, such as a pie, place it in a bowl and cover with boiling water. Let soak until tender and liquid is absorbed (one hour or longer). Thinly sliced fruits may not require soaking before using in cooked dishes.

Reconstituted or dried fruits are excellent in cobblers, breads, pies, puddings, gelatin salads, milk shakes and cooked cereals. Any liquid that remains after soaking can be used as part of the water needed in the recipe.

References

- DiPersio, P.A., Kendall, P.A., Sofos, J.N. 2006. Sensory evaluation of home dried fruit prepared using treatments that enhance destruction of pathogenic bacteria. *J Food Quality*, 29:47-64.
- DiPersio, P.A., Kendall, P.A., Sofos, J.N. 2004. Inactivation of *Listeria monocytogenes* during drying and storage of peach slices treated with acidic or sodium metabisulfite solutions. *Food Micro.*, 21:641-648.
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See Table 2, page 4,
for drying procedures
for specific fruits

Table 2. Steps for drying fruit.

Fruit	Drying Procedure
Apples	Select mature, firm apples. Wash well. Pare and core. Cut in rings or slices 1/8 to 1/4 inch thick or cut in quarters or eighths. Dip in ascorbic acid or other antidarkening/antimicrobial solution for 10 minutes. Remove from solution and drain well. Arrange in single layer on trays, pit side up. Dry until soft, pliable, and leathery; no moist area in center when cut (6-24 hours).
Apricots	Select firm, fully ripe fruit. Wash well. Cut in half and remove pit. Do not peel. Dip in ascorbic acid or other antidarkening/antimicrobial solution for 10 minutes. Remove from solution and drain well. Arrange in single layer on trays, pit side up with cavity popped up to expose more flesh to the air. Dry until soft, pliable, and leathery; no moist area in center when cut (24-36 hours).
Bananas	Select firm, ripe fruit. Peel. Cut in 1/8 inch slices. Dip in citric acid or other antidarkening/antimicrobial solution for 10 minutes. Remove and drain well. Arrange in single layer on trays. Dry until tough and leathery (6-10 hours).
Berries	Select firm ripe fruit. Wash well. Leave whole or cut in half. For berries with firm skins, dip in boiling water 30 seconds to crack skins. For berries with soft skins (strawberries), dip in ascorbic acid or other antimicrobial solution for 10 minutes. Remove and drain well. Place on drying trays not more than two berries deep. Dry until hard and berries rattle when shaken on trays (24-36 hours).
Cherries	Select fully ripe fruit. Wash well. Remove stems and pits. Dip whole cherries in boiling water 30 seconds to crack skins. May also dip in ascorbic acid or other antimicrobial solution for 10 minutes. Remove and drain well. Arrange in single layer on trays. Dry until tough, leathery, and slightly sticky (24-36 hours).
Citrus peel	Select thick-skinned oranges without mold or decay and no color added to skin. Scrub oranges well with brush under cool running water. Thinly peel outer 1/16 to 1/8 inch of the peel; avoid white bitter part. Dip in ascorbic acid or other antimicrobial solution for 10 minutes. Remove from solution and drain well. Arrange in single layers on trays. Dry until crisp (8-12 hours).
Figs	Select fully ripe fruit. Wash or clean well with damp towel. Peel if desired. Leave whole if small or partly dried on tree; cut large figs in halves or slices. If drying whole figs, crack skins by dipping in boiling water for 30 seconds. For cut figs, dip in ascorbic acid or other antimicrobial solution for 10 minutes. Remove and drain. Arrange in single layers on trays. Dry until leathery and pliable (12-24 hours).
Grapes and black currants	Select seedless varieties. Wash, sort, remove stems. Cut in half or leave whole. If drying whole, crack skins by dipping in boiling water for 30 seconds. If halved, dip in ascorbic acid or other antimicrobial solution for 10 minutes. Drain. Dry until pliable and leathery with no moist center (12-24 hours).
Melons	Select mature, firm fruits that are heavy for their size; cantaloupe dries better than watermelon. Scrub outer surface well with brush under cool running water. Remove outer skin, any fibrous tissue and seeds. Cut into 1/4- to 1/2-inch thick slices. Dip in ascorbic acid or other antimicrobial solution for 10 minutes. Remove and drain. Arrange in single layer on trays. Dry until leathery and pliable with no pockets of moisture (6-10 hours).
Nectarines and peaches	Select ripe, firm fruit. Wash and peel. Cut in half and remove pit. Cut in quarters or slices if desired. Dip in citric acid or other antidarkening/antimicrobial solution for 10 minutes. Remove and drain well. Arrange in single layer on trays pit side up. Turn halves over when visible juice disappears. Dry until leathery and somewhat pliable (6-36 hours).
Pears	Select ripe, firm fruit. Bartlett variety is recommended. Wash fruit well. Pare, if desired. Cut in half lengthwise and core. Cut in quarters, eighths, or slices 1/8- to 1/4-inch thick. Dip in citric acid or other antidarkening/antimicrobial solution for 10 minutes. Remove and drain. Arrange in single layer on trays pit side up. Dry until springy and suede-like with no pockets of moisture (6-10 hours for slices; 24-36 hours for halves).
Plums and prunes	Wash well. Leave whole if small; cut large fruit into halves (pit removed) or slices. If left whole, crack skins in boiling water 1 to 2 minutes. If cut in half, dip in ascorbic acid or other antimicrobial solution for 10 minutes. Remove and drain. Arrange in single layer on trays pit side up, cavity popped out. Dry until pliable and leathery (6-10 hours for slices; 24-36 hours for halves).
