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DRYING

Food Preservation
Lesson 6University Libraries
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Drying is one of the oldest methods of food preservation but not necessarily one of the best. The flavor, texture, and color of dried foods are usually quite different from those of fresh foods. Dried fruits are more acceptable than dried vegetables. The purpose of this publication is not to promote home drying but to outline the basic principles involved for those who want to dry home-grown foods.

Drying does have appeal because the process is relatively simple, does not require much in the way of specialized equipment or added ingredients, and does reduce the bulk of foods by approximately one fifth to one tenth of original volume. Canning and freezing are surer methods of food preservation because uniform procedures have been developed based on research.

Successful drying depends upon the removal of enough moisture from the food to prevent the growth of spoilage organisms. Moisture must be removed as quickly as possible at a temperature that does not seriously affect the flavor, texture, and color of the food. If the temperature is too low, the food may spoil before it dries adequately. If the temperature is too high and the humidity too low, the food may harden on the surface, making it more difficult for the moisture to escape and the food to dry.

Moving air is used to conduct heat to the food being dried and to carry moisture away from the food. The drying rate increases as the velocity of air flowing over food increases. Large surface areas and porous surfaces also promote drying.

EQUIPMENT

Sun drying is the most primitive method of drying. Pieces of fruit or vegetable are spread on trays, covered with netting, and set in a sunny place

to dry. For food to dry successfully, temperatures should be over 98°F. Food on the trays should be turned occasionally. It's also best to bring the trays of food indoors at night to prevent accumulation of moisture. A breeze will help to carry moist air away from the food. The relative humidity of the air will in a large measure determine how much drying occurs. Little drying will take place during periods of high humidity.

A home oven which can be regulated at 150°F can be used for drying. Moist air must be allowed to escape either through a vent or by leaving the door slightly ajar. Limit the oven load to 4 to 6 pounds of fresh prepared food at any one time.

If large quantities of food are to be dried, then a dehydrator may be built or purchased. A dehydrator is a specialized appliance, so be sure that dried foods are acceptable to the family before investing time and money in one. The cost of a dehydrator ranges from as little as \$50 to over \$250.

The chief advantage of a dehydrator is the ability to achieve optimum drying conditions by controlling temperature and humidity.

The air may be warmed by heat from the sun, from light bulbs, or from an electric heating element. It is desirable to have a thermostat to control the heat. A rating of 660 watts is adequate for up to 18 square feet of drying space. If purchasing an electric dehydrator, check for the Underwriter's Laboratory seal.

A fan or blower to move warm air over the food and to remove moist air will shorten drying time. Some dehydrators recirculate warm air rather than remove it. Although that appears to conserve energy, it may not if the moisture level of the air gets high enough to retard drying.

Cabinet construction can influence energy use. Double wall construction with insulation will reduce heat loss.

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Cabinet size -- both exterior and interior -- should be considered. The dehydrator usually sits on the kitchen counter so be sure there's enough space for it. Interior space is usually stated as square feet of drying space rather than cubic feet. Each square foot of tray space will hold from 1 1/2 to 2 1/2 pounds of food. Twelve square feet will hold about half a bushel of food.

Stainless steel trays or racks are excellent. Other metals may discolor and corrode. Shallow wooden trays can also be used. Trays should be slightly smaller than the oven to allow for air circulation. Trays with sides will prevent foods from sliding off, make stacking easier, and keep trays from crushing food when stacked.

SELECTION AND PREPARATION OF FOOD

Foods selected for drying should be of the highest quality possible -- fresh, sound, and at the right stage of maturity. Wilted or inferior quality food will not make a satisfactory dried product. Immature foods lack flavor and color. Overmature produce may be tough and fibrous, or may have become soft and/or mushy.

Trim away inedible and damaged portions. Cut into halves, strips, or slices that dry readily. A general guide is that pieces should be 1/8 to 1/4 inch thick.

Fruits and vegetables contain enzymes that are responsible for their maturation or ripening. These enzymes cause color and flavor changes, some of which may become more extensive when food surfaces are cut and exposed to air. The changes continue during drying and storage unless the enzyme activity is retarded or stopped. Vegetables are usually blanched in steam or boiling water before drying to inactivate enzymes. Blanch-

ing also helps to save some of the vitamin content, sets the color, hastens drying by relaxing the tissues, and helps insure satisfactory rehydration during cooking. Fruits may be blanched too, although many persons dry fruits without pretreatment.

Spread or arrange the prepared vegetable or fruit on the trays in a thin layer, not over 1/2 inch deep. A single layer will speed drying. Turn the food occasionally on the trays and turn the trays in the oven or dehydrator.

Fruits are dried to 16 to 25% moisture content; vegetables to less than 12% moisture content for satisfactory storage. Most fruits may be dehydrated in 6 to 20 hours; vegetables in 4 to 12 hours. Time will vary according to the kind of fruit or vegetable being dried, the size of the piece, tray loading, and the total quantity of food being dried. Pieces around the edges of the trays may dry more quickly than those in the center. If so, remove them to prevent scorching.

To test food for dryness, remove a handful and allow to cool for a few minutes. Warm foods seem softer, more moist, and more pliable than they actually are.

CONDITIONING AND STORAGE

Foods which have been air dried need to be pasteurized. Heat in a 150°F oven for 30 minutes or in a 175°F oven for 15 minutes.

Pack dried foods as tightly as possible into clean, dry containers which are insect and moisture proof. Package in small amounts. Seal lids of the containers to insure protection from insects and to prevent any reabsorption of moisture. Store in a cool, dry, dark place. Check from time to time during storage to see that food remains dry.

Table 1. Home Drying of Fruits
 For oven or dehydrator, set temperature at 140°F
 Sun drying requires temperatures of 98° to 100°F

Fruit	Preparation	Treat before drying. Choose one of the following method		Drying Times		Test for dryness (Cool before testing)
		Steam Blanch	Water Blanch	Sun Drying	Dehydrator	
Apples	Peel and core, cut into slices or rings about 1/8 inch thick	5 minutes, depending on texture		3-4 days	4-7 hours	Soft, pliable, no moist area in center when cut
Apricots	Pit and halve before steam blanch; after water blanch.	3-4 minutes	4-5 minutes	2-3 days	4-7 hours	Same as for apples
Figs	In dry, warm, sunny climates, figs normally drop from tree when 2/3 dry. In coastal areas, pick fruit when ripe	No treatment necessary		4-5 days	4-7 hours	Flesh pliable slightly sticky, but not wet
Grapes: seedless	Leave whole	No treatment necessary		3-5 days	3-5 hours	Raisin-like texture, no moist center
Nectarines and peaches	Leave whole, then pit and halve	8 minutes	8 minutes	3-5 days	4-7 hours	Same as for apples
Pears	Cut in half and core. Peeling preferred	6 minutes (peeled) will be soft		5 days	4-7 hours	Same as for apples

Table 2. Home Drying of Vegetables
 For oven or dehydrator, set temperature at 140°F
 Sun drying requires temperatures of 98° to 100°F

Vegetable	Preparation	Treat before drying Choose one of the following methods		Drying Times	
		Steam Blanch Minutes	Water Blanch Minutes	Sun Drying Hours	Dehydrator or Oven Hours
Beans, green	Wash thoroughly. Cut in short pieces or lengthwise.	2-2 1/2	2	-	2 1/2 -6
Cabbage	Remove outer leaves; quarter and core. Cut into strips 1/8 inch thick.	2 1/2 -3	1 1/2 -2	6-7	1-3
Carrots	Use only crisp, tender carrots. Wash thoroughly. Cut off roots and tops; preferably peel, cut in slices or strips 1/8 inch thick.	3-3 1/2	3 1/2	8	2 1/2 --5
Celery	Trim stalks. Wash stalks and leaves thoroughly. Slice stalks.	2	2	8	2-4
Corn, cut	Cut the kernels from the cob after blanching.	2-2 1/2	1 1/2	6	1-3
Okra	Wash, trim, slice crosswise in 1/8-1/4 inch disks.	No treatment		8-11	2-6
Onions	Wash, remove outer "paper - shells." Remove tops and root ends, slice 1/8-1/4 inch thick.	No treatment		8-11	1-6
Parsley	Wash thoroughly. Separate clusters. Discard long or tough stems.	No treatment		6-8	1-4
Peas	Shell.	3	2	6-8	3
Peppers and pimientos	Wash, stem, core. Remove "partitions." Cut into disks about 3/8 by 3/8 inch.	No treatment		6-8	2 1/2 -5
Squash, summer	Wash, trim, cut into 1/4 inch slices.	2 1/2 -3	1 1/2	6-8	2 1/2-6
Tomatoes, for stewing	Steam or dip in boiling water to loosen skins. Chill in cold water. Peel. Cut into sections about 3/4 inch wide, or slice. Cut small pear or plum tomatoes in half.	3	1	8-10	3 1/2 -8

Dry Storage of Vegetables

Some vegetables can be stored for several months in a cool basement, tool shed, garage, or soil-covered barrel at the edge of the garden without the bother and expense of canning, freezing, or drying.

Harvest vegetables at the proper stage of maturity to insure maximum storage life. Select only firm vegetables which are free from cuts and bruises and damage by disease and insects.

Dried beans and peas are among the easiest crops to store. They will keep for many months in a cool, dry location. Control weevils before storage by placing in a freezer at 0°F or lower for 4 days, or heat to 175°F for at least 15 minutes. Following this treatment, place the dry beans or peas in a tight container and place in a cool, dry place.

The brown Ebenezer onions are easy to store in a cool, dry basement. Other onions may be stored, but usually will not keep as long as the Ebenezer type. Pull mature onions when the neck above the shoulder becomes dry and the top falls over. Dry for a few hours in the sun and cut the leaves off about one inch above the top of the onion. Carefully remove the dirt and roots and place in shallow, open trays not more than 3 or 4 onions deep. Place on shelves and not on the basement floor, where it may be somewhat damp. The best storage temperature is 40°F, but onions will keep quite well in any moderately cool, dry place. Sort onions every few weeks to remove any which may start to decay.

Winter type pumpkins and squash are also very easy to store, and may keep for several months in a cool, medium dry basement, garage, or tool shed. Allow the fruit to ripen fully on the vine, and cure in the sun to form a hard rind. Harvest before frost, and leave a piece of stem on each when they are cut from the vine. Place

pumpkins and squash on shelves to reduce the possibility of rot. The best storage temperature is about 60°F.

Sweet potatoes will keep for several months in a medium dry basement. Handle sweet potatoes very carefully to avoid bruising or cutting. Cure for about 10 days at 80°F or for 20 days at 70°F to dry and toughen the skin. This can be done near the furnace in your basement. Store under medium dry conditions at 60°F, or as close to this temperature as possible. Sort sweet potatoes carefully every few weeks to remove any that may start to decay.

Green tomatoes may be stored for 4 to 6 weeks and will gradually ripen to a nice red color. The best storage conditions are about 60°F and a moderately moist atmosphere. Harvest the tomatoes in a firm, green condition before frost. Remove the stems to prevent puncturing other fruits. Wash dirt off rather than wiping, which may cause skin scratches which will be susceptible to decay. If the basement is quite dry, the tomatoes may be placed in film bags, or film-lined boxes to increase the humidity. Sort the fruit every week to remove those which ripen or start to decay.

Potatoes and root crops like beets and carrots require a cool, moist atmosphere for prolonged storage. They will keep for only a few weeks in the average basement. The storage life may be prolonged by covering with moist sphagnum peat moss, placing in film-lined boxes or crates, or in polyethylene bags with a few 1/4 inch holes for ventilation. The best temperature is 40°F which is difficult to achieve in the average cellar.

Cabbage, turnip, and rutabagas require the same moist, cool storage conditions as do potatoes and root crops. However, these crops emit considerable odor and should not be stored in the home basement.

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