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H. H. M.

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## DRYING FRUITS AND VEGETABLES IN THE HOME

**Extension Service      State College of Washington**

Drying is an old and satisfactory method of preserving a limited variety of fruits and vegetables. Used to supplement canning and storage, it is an inexpensive aid in securing an adequate variety of foods for winter use.

The preservation of food materials by drying is not a particularly difficult or complex process, but it has certain fundamental principals that must be clearly understood if the work is to be successfully carried out. The purpose is the removal of sufficient moisture to insure the product against spoilage. This must be done in such a way as to preserve the food value and as much as possible of the natural flavor, color, and cooking quality characteristic of the raw material.

Temperature and circulation of air are the two chief factors which must be considered. Expensive equipment is not necessary for drying small quantities, but some type of dryer which will facilitate the control of temperature and circulation of air, and protect the food from dust and insects is essential. A reliable thermometer is also an insurance against damaged products.

### Methods of Drying

Preserving foods by drying may be done in four ways: by **sun drying**, by **artificial heat** in the oven or a special drying apparatus, by an **air blast** created by an electric fan, or by combining any of the above methods. The method used should be chosen to suit the amount to be dried, the weather conditions prevailing, and the equipment available. The length of time required for drying depends upon the size and texture of the pieces to be dried, the temperature, and the rate of circulation of air over the drying trays.

### Selection of Food for Drying

Select food which is in prime condition for immediate table use. Drying cannot improve the quality of any material. It can at most preserve it without deterioration. Care should be observed in handling fruits to prevent bruising, and materials that deteriorate rapidly after gathering, such as sweet corn, should be gotten into the drier without delay.

### Treating with Sulphur Prevents Discoloration and Insect Attacks

The flesh of apples, peaches, pears, and apricots rapidly undergoes discoloration when the fruit is cut open and exposed to the air. The color changes are visible indications of the rapid chemical changes that are going

on and that injuriously affect the composition, flavor, and odor of the fruit if permitted to continue. Exposure of the fruit to the fumes of burning sulphur in a sulphuring box is the most satisfactory method thus far discovered for arresting these changes.

The box must be located outdoors and in such position that the fumes do not become a source of annoyance. If only small quantities of material are to be sulphured, the sulphuring chamber may be simply a tight packing box, or a wooden frame closely covered with roofing paper or wall board, of sufficient size to enclose a stack of trays, with about a foot of extra length. Two blocks of wood are laid on the ground to form a support, raising the lower trays several inches above the ground, and the trays, loaded with the prepared fruit, are stacked one upon another on this foundation, pieces of light lath being placed between them to facilitate the access of the fumes to all parts of the stack. The proper quantity of sulphur is placed in a heavy metal vessel such as an iron saucepan, ignited, placed in the open interval at the end of the stack, and a box is inverted over the whole in such a way as to fit snugly against the ground and allowed to remain for the requisite time. (See tables pages 4 and 5.)

### **Treating Prunes With Lye**

If prunes or plums are to be dried, equipment must be provided for dipping them in a hot lye solution, to crack or "check" the skin and thus facilitate drying. A prune-dipping outfit consists of a vessel, preferably enamel-lined, of suitable size to contain the lye solution, some means of keeping this vessel at boiling temperature, a basket or old bucket with the sides punched full of holes, to serve as a dipping vessel, and an abundant supply of running water, or, lacking running water, two or three tubs of clean, cold water, in which the prunes are rinsed free of lye after being dipped. The kettle is filled with a lye solution made by adding 1 pound of commercial concentrated lye to 10 gallons of water. This is heated to boiling. The fruit is placed in the dipping vessel and plunged into the solution for 30 to 45 seconds, then withdrawn and immediately transferred to one of the vessels of cold water, where the basket is moved about in the water for a minute or two to wash off the lye. The basket is then given a second and third dipping to complete the removal of the lye. The essentials of successful lye-dipping are (1) to keep the lye solution actually boiling when in use, as good checking of the skin will not occur if lye is not at boiling temperature, and (2) to give the fruit a thorough washing after it has been dipped to remove the lye that would otherwise be absorbed.

### **Preparing and Drying Vegetables**

The beginner is strongly advised to confine attempts to preserve vegetables by drying to a small number of products, for which directions are here given, and to employ canning or other means of preservation with other products. The chief reason is that many dried vegetable materials are much more prone to deterioration in flavor and table quality after drying than are dried fruits, especially after they have been stored for some months. This is especially true of those vegetables in which young, still rapidly growing parts of the plants are used, such as asparagus, spinach, celery, cauliflower, green snap beans, or green peas.

Such vegetables as it is advisable to attempt to preserve by drying require partial cooking before they are dried. The material may be placed in boiling water, but this results in a considerable loss of food value through solubility in the water. For this reason the precooking should be done in steam rather than in water if possible. A steam cooker or a pressure canner, if available, is ideal for the purpose. In the absence of a pressure cooker an ordinary wash boiler with a tight cover can be made to serve the purpose if it is fitted with a wire basket to contain the material and a support is provided to hold the basket above the level of the water.

### **Other General Considerations**

Small fruits and vegetables may be dried whole; larger products should be cut so as to expose more surface to the air.

Food should be spread  $\frac{1}{2}$  to 2 inches thick on drying trays and stirred frequently during the drying process to be sure that it dries evenly.

Generally speaking, flavor and cooking quality are best preserved by rapid drying, but the temperature must not be high enough to injure cell structure and cause loss of juices, or to scorch the product. For most products the temperature should run from about 120° to 150° Fahrenheit. The temperature can be raised slightly in the later stages of the drying process. Test temperature with thermometer placed on lowermost tray.

Always be careful to avoid dust and contamination by insects if food is dried out of doors. A glass covered drier can be inexpensively constructed and is a great convenience in sun drying, as well as insuring cleanliness.

Fruits should be dried until leathery but not hard. As they will appear softer when hot, a piece or handful should be cooled and tested for dryness. Most vegetables are dried until hard.

### **Conditioning and Storage**

Curing, or "conditioning," is the last step in drying previous to storage. Pile to distribute moisture, and keep the dried product in a fairly warm dry place for several days after taking it from the drying trays to be sure that it is thoroughly and evenly dried. Stirring occasionally is necessary to distribute the moisture evenly, and prevent molding. If the curing room or the storage bins have been properly protected against the entry of insects, material may be packed for storage as soon as the proper degree of dryness and even distribution of moisture have been reached. If there are any indications of insect infestation, the product should be returned to the drier, or heated to 165° to 180° Fahrenheit for 10 to 15 minutes before packing.

Dried food should be stored in sealed paper bags or boxes lined with paraffin paper, in muslin bags dipped in melted paraffin, or in tin containers. They should be kept in a dry place free from insects.

TABLE OF DIRECTIONS

Fruits or Vegetables	Selection of Varieties for Drying	Stage of Maturity and Condition	
Apples	Good cooking apples, especially autumn and winter maturing varieties.	Reasonably mature but not soft, free from discolored spots or bruises.	Parings slice, 1/4 inches deep or 20-30 minutes
Pears	Varieties with fine grained flesh, fairly high sugar content and distinct flavor—Bartlett and others.	Ripe but still firm.	Remove stem remove core Treat halves small pieces
Peaches	Any good table variety, especially those with high sugar content. Yellow fleshed varieties yield attractive dried products—Elberta, J.H.Hale, Early and Late Crawford and Slappy are good drying varieties.	Fully ripe—handle carefully to prevent bruising.	<b>Unpeeled:</b> —Wash pits—treat with 1% solution of sodium borate. Place in drying tray in some quantity. <b>Peeled:</b> —Dip in 1% solution (1 pound to 5 gallons) of 140° F. Plunge in quantity of cold water, rubbing between fingers. Rubbing between fingers. Split in halves. 20 to 30 minutes. Much red pigments may be cut be
Apricots	Any good table variety.	Pick from tree before ripe enough to drop.	Cut in halves 2 hours.
Cherries	Sweet cherries, especially solid fleshed varieties. Also sour or pie cherries.	Well ripened.	Wash, pick over perfect fruit. Dip in 1% solution if other use. Drying of whole fruit by dipping 20-30 minutes for prunes (s)
Prunes	Italian and Petite are chief drying varieties. Moist meated varieties are not desirable.	Fully ripe—ready to fall from the trees.	Immerse in 1% solution for 30 seconds for fruit. Wash thoroughly. Drying of whole fruit made of 1 pot. Wash thoroughly.
Berries	Loganberries, blackberries, red raspberries, dewberries, huckleberries, currants.	Firm ripe fruit.	Pick over to maged fruit.
Corn	Any good table variety.	In milk stage—gathered when cool and hastened into the drier.	Husk, trim away 8 to 12 minutes. Drain, cut from cobs, on trays.
Pumpkin and squash	Firm solid fresh pumpkin or squash.	Mature, in good condition for immediate use.	Cut in strips Cut in 1/2 to 3/4 inch or boiling water
Peas	Any good table variety, preferably wrinkled sorts.	Full grown but before seed begins to harden.	Shell—blanch in water (2 table
Green beans	Any stringless green, wax, or lima beans.	Full pods, fairly mature, without woodiness.	Shell—blanch

## DIRECTIONS FOR DRYING

Preparation	Drying	Test for Dryness
Paraslice, place immediately 1 to 1½ inches deep on trays. Treat with sulphur 20-40 minutes.	Place in evaporator at 130° F. Increase gradually to 175° F.	Elastic springy feel. Leave no moisture when pressed.
Remove stem and calyx. Split or quarter, remove core and central woody tissue. Treat halves with sulphur 3 to 4 hours—small pieces require shorter treatment.	Same as apples.	Same as apples.
<p><b>Unpeeled:</b>—Wash, split in halves, remove pits—treat with sulphur 2 to 4 hours. Place in drier when juice collects in some quantity in the stone cavity.</p> <p><b>Peeled:</b>—Dip 1 to 2 minutes in lye solution (1 pound to 5 pounds of water) at 135°-140° F. Plunge dipping basket into large quantity of cold water, or hold under running water, rotating the basket and finally rubbing between the hands to remove the skins. Split into halves. Treat with sulphur 20 to 30 minutes. (If variety is one having much red pigment around the pits, they may be cut before the lye dip.)</p>	<p>Unpeeled :—Temperature 130° F.-145° F. Increasing to 165° F.</p> <p>Peeled :—Temperature 125° F.-130° F. Increasing to 165° F.</p>	<p>Pliable and leathery.</p> <p>Same as above.</p>
Cut in halves. Treat with sulphur 1½ to 2 hours.	Same as peeled peaches.	Same as peaches.
Wash, pick over to remove stems and imperfect fruit. Large cherries may be pitted if other use can be made of the juice. Drying of whole cherries may be hastened by dipping 20-40 seconds in boiling lye as for brunes (see below).	Never over 150° F. Beginning temperature 120° F.	Leathery.
Immerse in boiling lye solution 15 to 25 seconds for fully ripe fruit, 35 to 45 seconds for immature fruit. Lye solution is made of 1 pound lye to 10 gallons water. Wash thoroughly in running water.	Temperature 130° F. first 3 or 4 hours, increasing to 175° F. as fruit becomes nearly dry.	When torn and pressed they should show no moisture.
Pick over to remove overripe or damaged fruit.	Spread in thin layers on trays. Temperature 130° F., increase to 145° F. or 150° F.	Show no moisture when pressed between the fingers.
Husk, trim away worm injuries, precook 8 to 12 minutes in boiling water or steam. Drain, cut from cob. Spread ½ to ¾ inches deep on trays.	Begin at 165° F. to 170° F. decreasing somewhat as it becomes dry.	Hard, semi-transparent.
Cut in strips 1 to 2 inches wide and peel. Cut in ½ to ¾ inch slices. Blanch in steam or boiling water 3 to 6 minutes.	Begin at 135° F. increasing to 140° F.	Leathery, no visible moisture when torn.
Shell—blanch 1 or 2 minutes in salted water (2 tablespoons salt to 1 gallon water)	Begin at 115° F. to 120° F. increasing to 140° F.	Hard.
Shell—blanch 3 minutes.	Beginning temperature 150° F.	Hard.

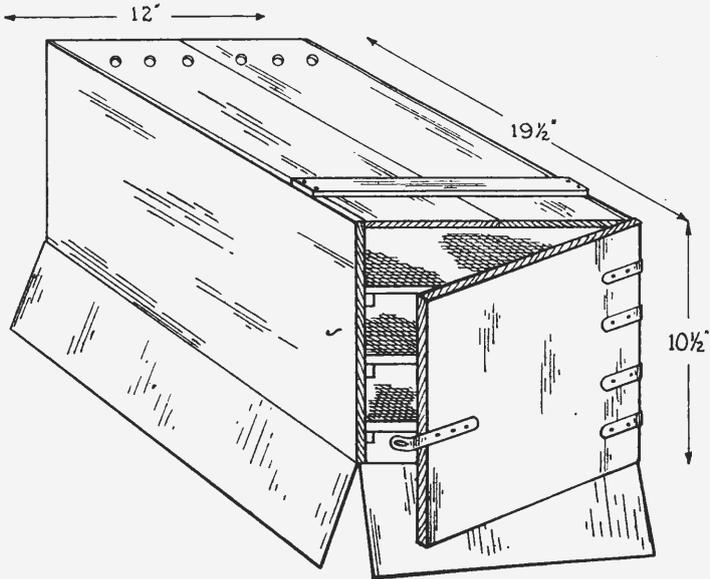
## HOME MADE DRIERS

There are several types of satisfactory home-made driers which can be made at small cost. Directions for making two types are given below:

### Drier Made from an Apple Box

This evaporator is made from an apple box, 12 inches wide,  $10\frac{1}{2}$  inches high and  $19\frac{1}{2}$  inches long. Remove one end of the box, being careful not to split the boards. Strengthen this end by nailing lath across the top and sides of the box. Nail three  $\frac{3}{4}$ -inch cleats or similar strips horizontally along the inside of each side of the box, the first one 3 inches from the top, the second 3 inches below the first, and the lowest 3 inches below the second. These cleats give support to three trays.

Next, construct the three trays,  $11\frac{1}{2}$  inches by  $17\frac{1}{2}$  inches. Each tray is made of a piece of  $\frac{1}{8}$ -inch galvanized wire mesh,  $11\frac{1}{2}$  inches by 20 inches. The 20-inch length allows for the wire to be folded over the ends, thus

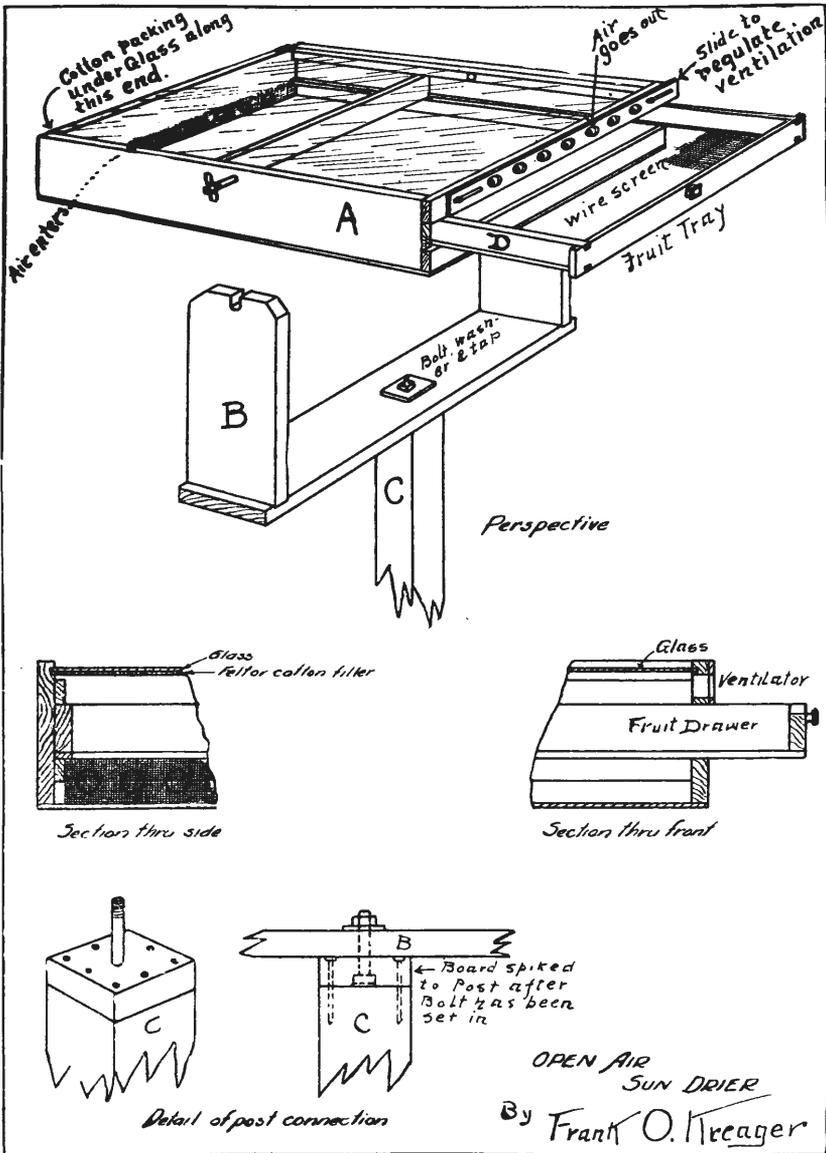


Drier Made From An Apple Box

strengthening the trays. Make framework of four  $\frac{3}{4}$ -inch strips, or similar pieces, side strips being  $17\frac{1}{2}$  inches long and end strips a little less than 10 inches long. Fit end strips in between the side pieces and nail. Staple wire mesh on frame and bend edges over.

For the door use the end originally removed from the box. Attach it to the box by means of four 1-inch pieces of leather. (If desired, metal hinges may be used.) The door is fastened by a slitted strip of oiled leather, hooked over a nail on the side of the box, if desired.

Raise the box drier about 4" above the stove by supports made by long spikes driven into the four corners, or other metal legs.



Prepare strips of tin to gather the heat from the stove into the box. With a can opener cut out the sides of four no. 10 tin cans—the size commonly used at bakeries and restaurants. Flatten and straighten the tin with pliers. Nail two of these pieces of tin along the sides on the outside of the box. Cut the other two pieces of tin into 11½-inch lengths. Nail one piece on the back of drier in same manner as on sides. Nail the other piece to the brace inside the front end. Cut three strips of tin to cover the lower sides of the two ends and the brace, to prevent charring from heat.

Air circulates at the bottom of the evaporator between the strips of tin at the corners. A row of holes across one end of the top allows the passage of air.

### CONSTRUCTION OF SUN DRIER

The construction of a satisfactory sun drier for home use is illustrated by the drawings. The drying box A can be made of any dimensions—a suitable size is two feet wide, three feet long, and seven inches deep. The box is mounted on the frame B, which in turn is mounted on a post C, in such a way that it may be tilted and turned to receive the maximum amount of sunlight during the entire day.

The glass top fits into a groove on the sides and top of the box and projects over the lower end in such a way as to lead off all rain. An opening of one-quarter inch is left between the glass and the lower end of the box. This opening is lightly packed with absorbent cotton. The drying tray D slides into the box between cleats fastened to the sides. It should be placed half way between the glass and the bottom.

The construction of the tray is indicated. Galvanized wire screen of three-sixteenths of an inch to one-fourth inch mesh is used for the tray.

Beneath the tray at the lower end of the box is a row of holes 1½ inches in diameter and two inches apart. A similar row of holes of the same size is placed above the tray at the upper end. Over these upper holes is placed a wooden slide with corresponding holes and so arranged that any degree of opening may be secured from wide open to entirely shut. In dusty regions a similar slide should be placed over the lower row of holes. If the box is rightly constructed, these slides when closed make it practically dust- and damp-tight. On the inside of the box a strip of wire screen is tacked over both rows of holes, making the box fly proof.

The drier should be thoroughly oiled with linseed oil or painted before using.

For further information on Drying and Drying Equipment, refer to Farmers' Bulletin No. 984, "Farm and Home Drying of Fruits and Vegetables" by Dr. Joseph S. Caldwell, Bureau of Plant Industry. Credit is given to the above mentioned bulletin for much of the material in this circular.

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