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How to Dry Fruits and Vegetables

by: Action for Food Production

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ACTION
FOR
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PRODUCTION

HOW TO DRY FRUITS and VEGETABLES

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AFPRO

INTRODUCTION

HOW TO DRY FRUITS AND VEGETABLES

The purpose of this booklet is to give practical information to women, specially women in the rural areas of India, on how to dry fruits and vegetables, which can then be preserved from times of plenty to be used in the lean seasons of the year. It can also be used as a handbook to teach village level Community Development workers who in turn can communicate these methods to the farmers wives.

The material was gathered by women Peace Corps Volunteers after experimentation, and edited and prepared in this from by Miss. Joya David, B.A., of AFPRO Staff, in New Delhi.

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ADVANTAGES OF DRYING FOODS

Preserving foods by drying does not take the place of canning foods and storing them in jars, or cans, but it has certain advantages:

1. Little storage place is required for dried foods
2. dried foods can be stored in containers that cannot be used for canning.
3. foods can be preserved economically for use during seasonal gluts.

When foods are dried, they may be reduced in bulk as much as 90% for example, 10 pounds of fresh food may be reduced to 1 pound of dried food. By this reduction no food value is lost, and the flavour is not greatly changed.

Dried food may be stored in plastic bags and cans. Hence, if space is limited and glass or tin containers are difficult to secure or are expensive, drying may prove a very satisfactory method of preserving food.

METHODS OF DRYING AND DRIERS

1. Sun
2. Stove or oven drying (placing food above a stove or in the oven)
3. Electric dehydrator

Plates or dishes may serve as driers when the drying is done in the oven. Most of the trays consist of a wood or metal frame over which wire netting is tacked. Single tray or a series of trays one placed above the other may serve as driers. When drying is accomplished by heat from a stove, the driers are hung over a stove, or they rest on the top of the stove. In the latter case, it is necessary that the frame of the tray be constructed so that the bottom of the tray must be of tin or galvanized iron to protect the food from kerosene fumes. The lowest tray must be placed at least 4 inches above the metal bottom.

SELECTING THE FRESH PRODUCT

Select fresh fruits or vegetables of <u>good quality</u>. Use only ripe fruit that has reached its full development and is in prime eating condition. Vegetables that are mature but still tender should be used. Over-mature vegetables tend to be tough, stringy, and flavourless.

Early morning harvest of vegetables, while the products are fresh and succulent, is recommended. Rapid handling of them will conserve vitamins ordinarily lost through long holding and storage. Under no condition should succulent vegetables be held longer than 6 hours after harvest before drying and it is essential they be kept cool during this time.

Make your dehydration plans to supply a variety of those fruits and vegetables that will provide the greatest amount of material. Your selection of foods should include items that will give variety in colour and flavour as well as nourishment.

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IMPORTANCE OF PROPER PREPARATION

Fresh fruits and vegetables contain many nutritive substances that are easily lost in storage, handling, and preparation. Conservation of these is important. Chief among these elements are vitamins, sugar, protein, and mineral, all essential to the body. When preparing the products certain steps are necessary to conserve some of these essential materials. Many, like Vitamin C, oxidize readily in the presence of air. Others, like sugar and minerals, dissolve in the washing or blanching procedure and are lost. With greater care given to each step in the preparation, more of these elements can be retained in the product.

PREPARATION FOR DRYING

To secure the best results, select mature but fresh vegetables. They should be in good condition, without blemish.

Certain foods, such as berries, cherries, peas, lima and shell beans, are dried whole. Most vegetables should be cut into slices from 1/8 to ¼ of an inch, in thickness. The slicing may be done with a paring or kitchen knife, or it may be done by means of a good chopper. It is necessary that all knives and cutting devices be clean. There should be no discolouration of the vegetable from the knife. It has been found advisable to blanch most vegetables before drying. Foods are not cold-dipped, however, after blanching when they are to be dried. Fruits are usually not blanched before drying.

PREPARATION OF FRUITS FOR DRYING

Washing is the first step in preparation. After cleaning, some fruits like apples, are hand-peeled, cored, and sliced. Others, such as apricots, are cut in half and the pit is removed. Peaches and mangoes are usually cut, halved, and pitted.

PRETREATMENT OF FRUITS

Sliced or cut fruit is subject to exidation or discolouration because the soft tissue is exposed; the exidation is caused by enzymes and the oxygen of the air.

As soon as the fruit is peeled or sliced, the cut surface should be temporarily protected. This can be done best by dipping the product in a weak salt solution (appromixately 3 tablespoons per quart of water). Discolouration during the drying process can be avoided by subjecting the fresh cut fruit to the fumes of burning sulphur. This treatment will also protect the dry fruit in storage against insects. All highly acid fruits that tend to oxidize or discolour readily need to be sulphured and must not be dried on wire-screen trays. To safeguard the product use only wood-slat trays.

Sulphuring takes from 30 minutes to 2 hours for most fruit products. Long sulphuring bleaches the colour, which will return as the product dries. The sulphur absorbed by the fruit acts as a preservative, as well as an antioxidant, and is almost completely driven off when the product is cooked.

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q Place the fruit on wood-slat trays and place in stacks off the floor in a room that can be rather tightly sealed to prevent the escape of the sulphur fumes. Stuffing the cracks around the doors and windows with cloth will ensure tight enough quarters. Sulphur is harmful to metal or rubber parts so check and remove these objects from your sulphuring room. Put $\frac{3}{4}$ of an inch of sulphur in a metal can (not enamelled) and heat on the stove until the sulphur is melted . The melted sulphur can be set aflame with a match or piece of burning paper. Then the can of burning sulphur is set in the middle under the trays and left for the recommended length of time.

SEE TABLE I (END OF BOOKLET)

PREPARATION OF VEGETABLES FOR DEHYDRATION

In general, the preparation of vegetables for dehydration is not different from their preparation for any other home use, But, caution should be taken to see that the pieces of the prepared product are of uniform thickness.

BLANCHING VEGETABLES

Blanching is the most important step in the preliminary treatment of vegetables. If the products are not thoroughly blanched, they will not retain their flavour, colour, or nourishing qualities. All fresh uncooked vegetables contain quantitites of enzymes. These enzymes are organic substances that cause changes in living tissues. They are present and active during the life of the vegetable and continue to function in breaking down plant materials unless they are inactivated. Blanching is the most practical process by which we can stop the action of enzymes that produce off flavours and odours during storage and make the dehydrated products undesirable for consumption.

Blanching is accomplished with the use of boiling water in a large 4 to 6 gallon cooker. Construct or purchase a wire basket that will fit inside the cooker. Fill the cooker at least half full of water and place on the hottest part of the fire to supply heat quickly. Bring the water to a vigourous boil. Place enough vegetables in the wire basket to fill it half full, submerge in boiling water, and agitate by stirring gently or by raising and lowering thebasket during blanching. It must be noted that large quantity of water drops less in temperature than small quantity when the cold vegetables are introduced; hence, for blanching in hot water use of a large cooker is imperative. Before blanching another basket of vegetables be sure the water has again come to a vigourous boil.

SEE TABLE II (End of Booklet)

METHODS OF DRYING FOODS

Place the prepared food on drying trays. Unless the drying is done in the oven, cover the food with cheese-cloth. If possible, track the cloth to the frame so that no dust or insects can come in contact with the food. Stir or turn food once or twice a day while they are drying. This is especially necessary when food is dried in the sun.

1. If the food is to be dried in the sun, place the tray containing the food in the sun, where there is a breeze. If it rains, take the tray indoors. Also bring the tray indoors just before sunset.

2. If the food is to be dried in the oven, place the food on plates or trays. Oven drying is much more satisfactorily done if the oven is provided with a thermometer. It is often necessary to keep the door open so that the temprature does not become too high (it usually varies from 115°F to 175°F).

3. If the food is to be dried in a mechanical dehydrator, place the food on suitable trays and place in dehydrator for the specified length of times stirring occassionally. Be sure the temperature is maintained according to instruction

TESTING FOR SUFFICIENT DRYING AND CONDITIONING

The time for drying varies with the method of drying and the kind of food. A definite time of drying cannot be stated.

When first taken from the drier and cooled, vegetables should be rather brittle and fruits rather leathery and pliable. One method of determining whether fruit is dry enough is to squeeze a handful; if the fruit separates when the hand is opened, it is dry enough. Another way is to press a single piece; if no moisture comes to the surface the piece is sufficiently dry.

SEE TABLE III (End of booklet)

When the food is sufficiently dry it should be placed in boxes or bowls and covered with clean cloth. The dried food should be stirred or poured from one container to another once a day for 10 days or two weeks. If at the end of this time the food is found to be moist, it must be subjected to the drying process for a short time. After the second drying, it should be treated as directed above. If the food is observed for several days and found to be moist, it must be subjected to the drying process for a short time. After the second drying, it should be treated as directed above. If the food is observed for several days and found to be dry it may be stored away. This process of testing and making them sufficiently dry after removing from the drier is termed 'conditioning'.

PACKING AND STORAGE OF DEHYDRATED PRODUCTS

Keeping quality of dehydrated products depends, to a considerable extent, on their final moisture content. The lower the moisture content, the better the keeping quality. After drying, fruits and vegetables will take up moisture from the surrounding air if allowed to remain exposed for any length of time. This absorption takes place rapidly on days when the natural humidity of the air is high. To avoid absorption and to improve keeping quality, store under moisture proof conditions immediately after drying and during 'conditioning', also.

The best type of container for dehydrated products are glass jars with tight seals. It is extremely important to clean them well to remove all traces of odour that might contaminate the dehydrated products. Dried vegetables such as carrots are quite susceptible to flavour changes and foreign odours. Cans with tight seals that are moisture proof can likewise be used. It is imperative, however, that any type of container used must be sealed to prevent air leakage. Air leakage means moisture absorption and the possibility of insect infestation. Before placing the freshly dehydrated products in containers, be sure that the cans, jars, or containers have been thoroughly dried out. Place the freshly dehydrated product in the hot or still warm container. Fill the containers as much as possible.

Use smaller containers to avoid opening and exposing large batches of dehydrated food. Large tin cans with air tight covers can be used to store many small vapour-proof cellophane packages. These small packages should contain a complete serving for the family. Use of small packages preserves the product against breakage and moisture absorption. Removal of a bag for serving is a simple procedure and involves no damage to the rest of the food material stored in the can. Cool storage is essential for long keeping of packaged dried material. This can be accomplished by the use of a cellar or underground chamber.

PREPARATION OF DEHYDRATED FOOD FOR COOKING

Some dehydrated foods benefit by preliminary soaking, while others, especially the green, leafy vegetables refresh during cooking. The size of the pieces determines to a large extent, the length of the time for soaking. The larger pieces take up the water more slowly, while the smaller pieces such as shreds, dices, slices, etc., have more surface per unit volume for absorption of water and refresh more quickly. If a food is left to soak too long, it may become water-logged and produce an unattractive product when cooked. Mangoes soaked 24 hours, then cooked, do not have the attractive shape, firmness, or flavour of mangoes soaked only 12 hours before cooking.

Fruits can be soaked overnight without spoilage, but dehydrated vegetables, if allowed to soak more than 2 hours, may show evidence of spoilage.

Foods that have been soaked should be cooked in the water in which they were soaked. Just enough water should be used to allow for refreshing and for cooking. As the majority of vegetables have been precooked or blanched before drying, they will not require as much time to cook as fresh vegetables. The cooking required will depend on the stage of maturity at the time the vegetable were dried. When soaking and cooking, use 1½ to 2 measures of water for every measure of dehydrated vegetable with the exception of green leafy vegetables. Cook all food until tender. The food may be soaked in the container in which they will be cooked. More water can be added before cooking if needed, but none should be poured off.

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Onions to be used as flavouring may be powdered and a bit of powder added as seasoning to foods without refreshing. If onion slices are wanted, the slices should be soaked for 15 minutes in water, then simmered gently for 20 to 30 minutes. One tablespoon on onion will need 3 tablespoons of water for refreshing.

Dehydrated food that has been properly prepared makes attractive and flavourable dishes.

TABLE - I
DIRECTIONS FOR PREPARING AND DEHYDRATING FRUIT

PRODUCT	STAGE OF MATURITY	PREPARATION	TREATMENT BEFORE DEHYDRATION		SPREAD TRAY Lbs./Sq. Ft.
			Method	Time	
Apples	Firm, ripe	Peel, core, slice or cut in eights; light drine dip protects colour of fruit	sulphur	1½ hrs,	1¾ lbs.
Apricots	Firm ripe	cut in halves, remove pits	sulphur	1 - 1½ hrs	1¾ lbs.
Cherries pitted unpitted	full ripe	Pitted cherries dry quicker than unpitted spread carefully	sulphur	½ hour	1¾ lbs.
Peaches or Mangoes	full ripe	cut in halves: remove pits	sulphur	1 - 1½ hrs.	1¾ lbs.
Pears	firm, ripe	cut in halves; core	sulphur	1½ hours	1¾ lbs.
Prunes	full ripe	whole or halved prunes can be dried. Pitted fruit dries more rapidly	sulphur	½ hour	1¾ lbs.
Bananas	firm, ripe	peel, halve length-wise or slice ¼ inch thick crosswise	sulphur	½ hour	1¾ lbs.
Rhubarb	Mature	trim, wash, cut in slices ½ inch thick	steam	2-4 minutes	1¼ lbs.
Date	full ripe	wash gently	sulphur	½ hour	1¾ lbs.

TABLE - I

Continuation ...

PRODUCT	APPROXIMATE YIELD FROM 100 POUNDS OF FRESH MATERIAL		DEHYDRATED PRODUCT	
	Prepared	Dehydrated	Condition when Dry	Keeping Quality
Apples	60 lbs.	10 lbs.	springy	good
Apricots	90 lbs.	18 lbs.	leathery	good
Berries	100 lbs.	15-18 lbs.	springy	good
Cherries, pitted unpitted	78-80 lbs. 97-98 lbs.	26-30 lbs. 28-30 lbs.	leathery leathery	good good
Peaches or Mangoes	85-90 lbs.	15-20 lbs.	leathery	good
Pears	80-85 lbs.	15-20 lbs.	leathery	good
Bananas	85 lbs.	15 lbs.	brittle	good
Rhubarb	55-60 lbs.	6-9 lbs.	tough	good
Prunes	100 lbs.	33-35 lbs.	pliable	good
Date	100 lbs.	33-35 lbs.	pliable	good

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TABLE - II

DIRECTIONS FOR PREPARING AND DEHYDRATING VEGETABLES

PRODUCT	STAGE OF MATURITY	PREPARATION	TREATMENT BEFORE DEHYDRATION		SPREAD ON TRAY Lbs/Sq.Ft.	APPROXIMATE YIELD FROM 100 Lbs. Fresh Vegetables.	
			Method	Time Min.	-	Prepared	Dehydrated
Beans (green)	mature, tender not stringy	snip, cut into 1" lengths	blanch	5-8	¾ lb..	90 lbs.	9-12 lbs.
Beans (Lima)	Tender, Immature	shell, wash	blanch	3	¾ lb.	30-35 lbs	15.18 lbs.
Beets	good for table use	wash, trim & cook for 15 min., peel, slice 1/8" thick	blanch	2	¾ lb.	75-80 lbs.	8-12 lbs.
Broccoli	good and juicy	trim, wash & slice lengthwise	blanch	3-4	¾ lb.	80 lbs.	10-12 lbs.
Cabbage	good and juicy	trim, core, wash, cut in 1/8" shreds	blanch	3-4	¾ lb.	85 lbs.	6-9 lbs.
Carrots	medium sized, juicy	wash, peel, trim, cut in slices 1/8" thick	blanch	2	¾ lb.	80-85 lbs.	8-9 lbs.
Cauliflower	mature	wash, trim, break into 1" flowerettes	blanch	4-6	¾ lb.	75-80 lbs.	9-10 lbs.
Spinach	good table condition	cut off roots, wash trim	blanch	2	½ lb.	60-75 lbs.	8-10 lbs.

TABLE - II

Continuation.....

PRODUCT	STAGE OF MATURITY	PREPARATION	TREATMENT BEFORE DEHYDRATION		SPREAD ON TRAY LBS/ SQ.FT.	APPROXIMATE YIELD FROM 100LBS. FRESH VEGETABLES	
			Method	Time		Prepared	Dehydrated
Sweet potatoes	good table condition	trim,peel,wash slice in ½"slices	blanch	6-8	1 lb.	80-85 lbs	26-28- lbs.
Tomatoes	firm,good table use	peel,core,cut into 3/8" thick	blanch	1½	¾ lb.	88-92 lbs	4-5 lbs.
Turnips Radish	mature,tender,not woody	trim,peel,wash. Slice ¼" thick	blanch	1-2	¾ lb.	81-85 lbs.	8-10 lbs.
Eggplant	Young, tender	wash,peel,slice ¼"	blanch	2	¾ lb.	90 lbs.	9-12 lbs.
Corn	milk stage	husk,wash,cut from cob after blanching	blanch	8-12	1 lb.	35-40 lbs.	8-10 lbs.
Okra	young,tender	wash,slice ¼" thick	blanch	3	¾ lb.	90 lbs.	9-12 lbs.
Onions	mature,juicy	trim,remove outer leaves. wash,slice 1/8" thick	none	none	¾ lb.	88-90 lbs.	8-9 lbs.
Parsnips	mature,tender, not woody	wash,peel,trim. Cut into 1/8" thick slices	blanch	2	¾ lb.	77-82 lbs.	8-9 lbs.
Potatoes	good for table	peel,trim,wash. cut into slices ¼" thick	blanch	2-3	1 lb.	72-76 lbs.	10-12 lbs.
Peas	full,grown,not hard	pod,wash	blanch	3-5	1 lb.	55-60 lbs.	18-23 lbs.
Pumpkin	good for table use	peel,seed,wash, slice 1/8" thick	blanch	3-6	¾ lb.	70-72 lbs.	7-12 lbs.

TABLE II
Continuation

PRODUCT	DEHYDRATED PRODUCT	
	Condition When Dry	Keeping Quality
Beans (green)	Brittle, greenish black	Good
Beans (Lima)	Hard, wrinkled	Good
Beats	Brittle	Good
Broccoli	Brittle	Good
Cabbage	Brittle	Good
Cauliflower	Tough, Brittle	Good
Carrots	Brittle	Fair
Corn	Brittle	Good
Eggplant	Tough	Good
Okra	Brittle	Good
Onions	Brittle	Good
Parsnips	Brittle	Good
Potatoes	Hard, Brittle	Good
Peas	Hard, wrinkled, Brittle	Good
Pumpkin	Tough, Brittle	Good
Spinach, or greens	Crisp, brittle	Good
Sweet Potatoes	Hard, brittle	Good
Tomatoes	Tough, Brittle	Good
Turnips Radishes	Tough, brittle	Good

TABLE III

FRUIT AND VEGETABLE REFRESHING TABLE

PRODUCT	RECONSTITUTION PROPORTION Volume of Food	Volume of Water	TIME OF SOAKING	TIME OF COOKING
FRUITS	CUPS	CUPS		MINUTES
Apples	1	1	1 hr	10
Apricots	1	1	1½ hrs	15
Bananas	1	1	30 min	15
Berries	1	1½	8-12 hrs	10
Cherries	1	2	8-12 hrs	20-30
Dates	1	1	8-12 hrs	20
Peaches or Mangoes	1	1¼	8-12 hrs	15
Pears	1	1¼	8-12 hrs	15
Prunes	1	1	8-12 hrs	15
Rhubarb	1	1½	30 min	15
VEGETABLE				
Beans (green)	1	2	30 min	20
Beans (Lima)	1	2½	30 min	15
Broccoli	1	1	30 min	5
Cabbage (shredded)	1	1½	none	10
Carrots (shredded)	1	1¼	30 min	10
Corn	1	2½	30 min	15
Eggplant	1	2	30 min	15
Parsnips	1	2	30 min	15
Peas	1	2½	30 min	10
Peppers	1T.*	2T.*	30 min	10
Potatoes	1	2	30 min	20
Potatoes (sweet)	1	1½	30 min	30
Pumpkin (Shredded)	1	1	30 min	10
Rutabagas	1	2½	30 min	10
Spinach	1	1½	none	10
Squash	1	1	30 min	10
Tomatoes	1	1½	none	15
Turnip Radish	1	2½	20 min	10
Beets (shredded)	1	2	30 min	10
Okra	1	2	30 min	15

* Tablespoons