WLG 481

West Virginia University
EXTENSION SERVICE

Dehydration: A Time-Honored Method of Preserving Food

Janice Heavner, WVU Extension Agent, Pendleton County
Patty Morrison, WVU Extension Agent, Wirt County
Shirley Wilkins, WVU Extension Agent, Pocahontas County

Educational Objectives

1. Understand the origin of dehydration as a method of preservation.
2. Identify the benefits of dehydration.
3. Learn the methods of dehydration.

History

Dating back to 12,000 B.C., dehydration is one of the oldest methods of preservation used in the Middle East and Oriental cultures. Later cultures left evidence of their methods that reflected their food supplies – fish, wild game, domestic animals, etc. For example, the Romans were particularly fond of dried fruit.

Primarily, the sun and wind were used to dry foods naturally. In the Middle Ages, 'still houses' were created to dry fruits, vegetables, and herbs in areas that did not have enough sunlight for drying. Fire was also used to create heat needed to dry or smoke food. In 1795, the first dehydrator for drying fruits and vegetables was introduced in France.

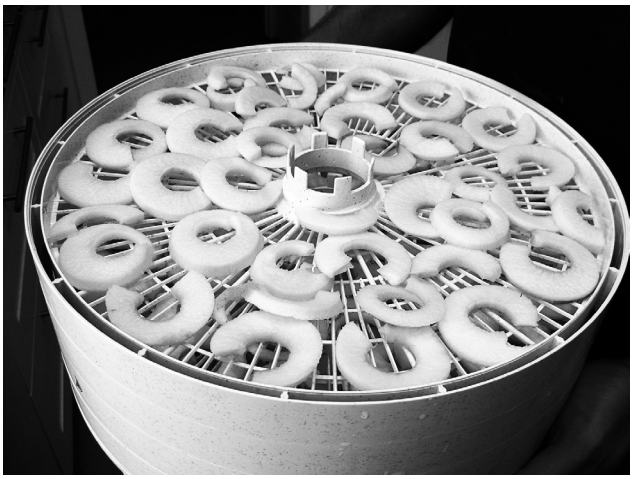
Benefits

Food dehydration requires just one ingredient – the food you're drying. The result is 100 percent natural food that will stay tasty and nutritious for many months. Drying food will help you preserve food to store year round. You can manage a bigger garden, accept more from your friends' gardens, or buy that case of ripe bananas you find on sale – instead of letting the food go to waste.

Dried fruits make a healthy snack, and dried vegetables can be added to soups, stews, and casseroles. Meat jerky, dried nuts, and dried seeds are good sources of protein for a snack or a meal. When drying

– continued –

foods, you retain nutrition and add antioxidants to your diet. Many dried fruits, such as fruit leathers, are sweeter than fresh fruit.



The Process

According to the National Center of Home Food Preservation, mold, yeast, and bacteria need water to grow. The dehydration process removes the water, thus microorganisms cannot grow. If the food item has been dried correctly, it will not spoil. Once the drying process is complete, food items will be smaller and lighter weight because the water has been removed.

The best temperature for drying food is 140 degrees Fahrenheit. If the temperature is higher, you risk cooking the food instead of drying it. If this occurs, it will most likely spoil. Low humidity is beneficial for the drying process. The moisture contained in food must escape into the surrounding air and if the air is humid, the drying process will be slowed down. Increasing air flow will help shorten the drying time by moving the moist air away from the food.

Methods of Drying

There are different methods of drying foods. Research is required to determine proper methods of preparation, pretreatment, drying times, and conditioning measures. Foods can be dried directly in the sun, in an oven, or (most popularly) in a dehydrator. To be successful, these methods must incorporate the right combination of warm temperatures, low humidity, and airflow.

To learn more about drying, refer to the National Center for Home Food Preservation at *http://www.nchfp.uga.edu* or the West Virginia University Extension Service at *http://www.fh.ext.wvu.edu*. The additional handout, "Fruits and Vegetables At A Glance" found at *http://www.fh.ext.wvu.edu/publications/ceos-lessons*, will also assist in selecting the proper methods for each type of fruit and vegetable.

Sun Method

When drying in the sun, make sure there is not too much humidity in the air. High humidity may keep the product from drying properly, resulting in an unsafe product. Fruits are safe to dry in the sun because of the high sugar and acid content. To dry fruits in the sun, you must have hot, dry, and breezy days. The temperature must be at least 85 degrees Fahrenheit and humidity must be below

60 percent.

Most vegetables, however, cannot be dried in the sun, with the exception of vine dried beans. It is not recommended to dry meats outdoors, because they are high in protein. When the heat and humidity cannot be controlled, sun drying can lead to harmful bacteria growth.

Oven Method

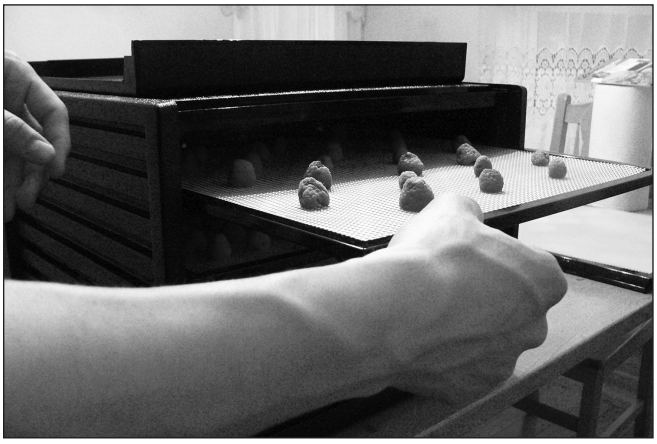
Drying in an oven can be easier because the temperature can be controlled; however, it can be expensive because of the amount of time required. When using an oven, vegetables must be watched closely to prevent scorching.

Preheat the oven at the lowest temperature (140 to 150 degrees Fahrenheit). Then, adjust the thermostat and prop the oven door open to create a consistent temperature of 140 degrees Fahrenheit, which allows the moisture to escape. Placing an electric fan beside the oven will keep the air circulating.

Place the food on trays in the oven. Stack trays so there is at least 3 inches between the top and bottom of the oven and 2½ inches between trays. Trays should be shifted top to bottom and front to back every half hour. If the food is ½ inch deep or more, you should stir the food often.

Use a calibrated oven thermometer to keep the oven temperature at 140 to 150 degrees Fahrenheit. Check every two hours by placing it directly on the oven rack.

If you choose the oven method, do not use galvanized screening for the tray bottoms. Aluminum is not recommended either, because it may discolor or corrode with use.



Dehydration Method

The most popular method of drying food uses an electric dehydrator with thermostatic controls. There are two basic designs – horizontal airflow and vertical airflow. On a horizontal airflow dehydrator, the heating element and fan are located on the back of the unit. However, on a vertical airflow dehydrator, the heating element and fan are located in the base or the top of the unit.

A horizontal dehydrator can dry several different foods at one time, because all trays receive equal heat penetration. It is recommended to use a vertical airflow dehydrator to dry one food item at a time, due to the mixing of flavors resulting from the position of the heating element and fan. Remember, all dehydrators should be used indoors in a dry, well-ventilated room.

Place food in a single layer on each tray. Overlapping layers will prevent the air from circulating properly between the trays. Read the manual for your dehydrator to determine if the trays need to be rotated during the drying process.

Storage of Dried Foods

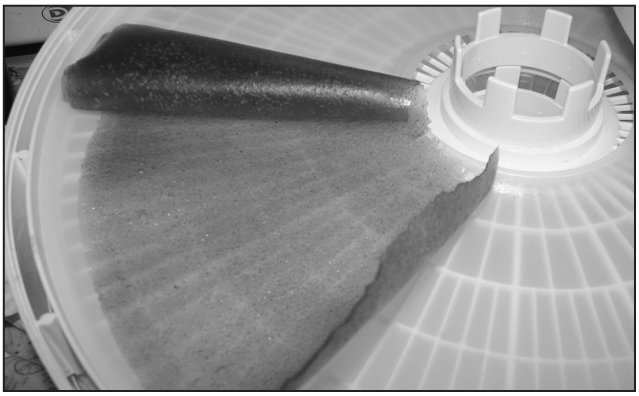
After the drying process is complete, foods need to be conditioned before storing. Conditioning is the process used to evenly distribute moisture left in food after dehydration which could cause mold to grow. This is especially important for fruits, herbs, and seeds.

To condition a food you need to:

- Cool food on trays.
- Pour into a large, nonporous container made of food-grade material. Only fill the container about ⅔ full.
- Cover the container and place in a convenient, warm, dry place. Shake the container or stir contents at least once a day for 10 to 14 days.
- Check for condensation on the lid and any signs of spoilage. If condensation occurs, return the food to the dryer to finish drying.
- Cool thoroughly before packaging.

After the food has been conditioned, pack it into clean, dry, insect-proof containers as tight as possible without crushing. Canning jars work well for this. You can also use plastic freezer containers with tight-fitting lids or plastic freezer bags. Vacuum packaging is another good option. Pack the food in amounts that can be used all at once. Each time you open the package, the food is exposed to air and moisture, which can lower the quality or result in spoiled food.

Dried foods should be stored in a cool, dry, dark area. Storage times for dried foods range from four months to one year. Storage temperature determines the length of storage time. The higher the temperature, the shorter the storage time. Most fruits can be stored for one year at 60 degrees Fahrenheit, or six months at 80 degrees Fahrenheit. Vegetables can be stored half the time of fruits.



Drying Fruit Leathers

- Select ripe or slightly overripe fruit.
- Wash fresh fruit or berries in cold water. Remove peel, seeds, and stem.
- Cut fruit into chunks. Use 2 cups of fruit for each 13- to 15-inch fruit leather. Puree fruit until smooth.
- To prevent darkening, add 2 teaspoons of lemon juice or ⅛ teaspoon ascorbic acid (375 mg) per each 2 cups of light-colored fruit.

Optional: Fruit leathers are naturally sweet, but if additional sweetness is desired use ¼ to ½ cup sugar for immediate use or short storage of the leather. To increase shelf life, corn syrup or honey can be used in place of sugar. Saccharin-based sweeteners could also be used to reduce tartness without adding calories. Note that aspartame sweeteners may lose sweetness during the drying process.

Approximate drying times are six to eight hours in a dehydrator, up to 18 hours in an oven, and one to two days in the sun. Dry fruit leathers at 140 degrees Fahrenheit. Test for dryness by touching center of leather; no indentions should be evident.

Sources

DiPersio,P.A., Yoon, Y., Sofos, J.N., Kendall, P.A. 2005. *Inactivation of Salmonella during Drying and Storage of Carrot Slices Prepared Using Commonly Recommended Methods.* J Food Science, 70:M230-M235.

"So Easy to Preserve," 5th ed. 2006. Bulletin 989, Cooperative Extension Service, The University of Georgia, Athens. Revised by Elizabeth L. Andress, Ph.D. and Judy A. Harrison, Ph.D., Extension Food Specialists.

National Center for Home Food Preservation, *http://www.nchfp.uga.edu.*

Quality for Keeps: Drying Foods, GH1562. Revised March 2010, University of Missouri Extension, *http://extension.missouri.edu/p/GH1562.*

2014

Programs and activities offered by the West Virginia University Extension Service are available to all persons without regard to race, color, sex, disability, religion, age, veteran status, political beliefs, sexual orientation, national origin, and marital or family status. Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Director, Cooperative Extension Service, West Virginia University.

The WVU Board of Governors is the governing body of WVU. The Higher Education Policy Commission in West Virginia is responsible for developing, establishing, and overseeing the implementation of a public policy agenda for the state's four-year colleges and universities. FH14-385

Page two photo1: *https://www.flickr.com/photos/kat1980/5034405822* by Katrina Parks

Page three photo1: *https://www.flickr.com/photos/dreamexplorer/3552798275* by Keith Simmons

Page three photo2: *https://www.flickr.com/photos/lynnszwalkiewicz/3410976737* by vigilant20

Page four photo: *https://www.flickr.com/photos/tesselene/472617200* by born_to_me