

DRYING FOODS

Objectives

After completing this unit, you should be able to:

1. Identify methods of drying suitable for New York State
2. Compare available drying equipment
3. Identify steps and methods of the food drying process

In this Lesson:

Topic	Page
Introduction	2
Methods and equipment	2
Choosing a food dehydrator	2
Choosing food for dehydration	3
Preparing food for dehydration	4
Drying procedures	4
Testing for dryness	5
Preparing food for storage	5
Packaging and storing	5
Using dehydrated food	6
Possible problems	6
Drying methods that should not be used in New York State	6
Supplement	8
Study Questions	
Supplement <i>Food for Health: Drying Foods in New York State</i> , Cornell http://www.mycce.org/monroe/nutrition/foodforhealth_drying.pdf	
Supplement <i>Handy Reference for Drying Fruits</i> , Cornell http://www.mycce.org/monroe/nutrition/dryingfruits.pdf	
Supplement <i>Handy Reference for Drying Vegetables and Herbs</i> , Cornell http://www.mycce.org/monroe/nutrition/dryingvegetables.pdf	
Supplement <i>Handy Reference for Drying Meat Jerky</i> , Cornell http://www.mycce.org/monroe/nutrition/dryingmeat.pdf	
Supplement <i>Drying Jerky</i> , National Center for Home Food Preservation http://www.uga.edu/nchfp/how/dry/jerky.html	

Introduction

The oldest form of food preservation is drying or dehydrating. In this method food is preserved when sufficient moisture is removed to prevent the growth of spoilage- and illness-causing microorganisms.

Advantages of dried foods:
(they are ...)

- lightweight
- compact
- easy to transport
- a good source of concentrated nutrients and flavor

(have a ...)

- reasonably long shelf life

Disadvantages of drying foods:

- takes a long time to dry (time consuming)
- relatively expensive (cost of equipment, fuel, time, food, freezer storage)
- only a small quantity can be dried at a time

Methods and equipment

The following methods are recommended:

- Electric dehydrator – most effective because the operator has control over the drying process
- Conventional oven – requires more attention than a dehydrator, but will dry food if a relatively constant temperature of 75 – 85° F for herbs; 140° F for fruits and vegetables, 145° – 160° F for meats is achieved.
- Convection oven – better than a conventional oven because of the built-in fan that circulates the warm air
- Microwave oven – ineffective air circulation allows only drying of herbs before the food cooks
- Air Drying – herb stalks may be hung in a ventilated brown paper bag. No other foods should be air dried because of the high humidity in New York State.

Choosing a food dehydrator

Commercially manufactured dehydrators come in different sizes and shapes and with varied features. They should have a heat source regulated by a thermostat, a method to take the moist air away from the food, and be easy to clean.

- Heat Source

Heat sources should have an adjustable thermostat with a range of 85° – 160° F, which is the most effective temperature for drying a variety of different foods. 660 watts will dry an area up to 18 square feet, 1000 watts will dry up to 24 square feet. Too little wattage will result in food spoilage. Too much wattage will cook food or cause the outside to harden and leave inside to spoil. Light bulbs are very inefficient, especially in dehydrators without fans.

- **Built-in fan**
Dehydrators with built-in fans are more efficient and effective in removing moisture than ones that depend on natural convection currents. The fan may move warm air either vertically or horizontally across the food. In dehydrators without fans, convection currents cause air to rise so that drying more than one kind of food at once results in mixed flavors.
- **Drying trays**
Trays made of mesh or screen allow for good air circulation. They should be strong and easily cleaned. Usually trays are made of food grade plastic or Teflon coated fiberglass, as metals tend to hold heat. Solid drying trays are used for drying extremely moist food, like fruit leathers. Additional trays are available on some models.
- Ease of cleaning – trays and equipment should be easy to keep clean. A well-maintained dehydrator will last for many years.

Choosing food for dehydration

Fruits

- Most can be dried successfully
- Use fully ripe, firm fruit of excellent quality
- Small fruits may be dried whole if skin is broken
- Cut large fruits into even sized pieces
- Fruits may be cooked and pureed and dried in thin sheets (leathers)

Vegetables

- Drying does not improve quality
- Use young, tender, ripe, fresh vegetables
- Over mature vegetables become tough and woody
- Do not dry vegetables normally eaten raw (radishes, cucumbers and leafy greens), as objectionable flavors and textures result
- Blanching before drying is necessary to destroy enzymes

Herbs

- Leaves, blossoms and seeds of some herbs may be dried successfully
- Harvest herbs just before flowers open
- Dry fresh herbs only

Meats

- Fresh lean meat can be used for making jerky
- Beef, pork, smoked turkey breast, venison and other game meats may be dried
- Poultry develops an objectionable texture and flavor
- Choose lean round, flank, chuck, rump, or brisket and cut away visible fat
- Highly marbled and fatty cuts will quickly become rancid if dried. Choose lean.

Preparing food for dehydration

All vegetables, fruits and herbs to be dried must be thoroughly washed. Depending on the food, it should be peeled if necessary, and cut into uniform pieces, pitted, trimmed, and cut 1/8 to 1/4-inch thick.

Blanching

- steam blanching fruits and herbs– stops enzyme action, retains color and slows oxidation
- syrup blanching fruits – retains color fairly well, product is similar to candied fruit
- boiling water blanching vegetables (1 # vegetable to 1 gallon water) – stops enzyme action, retains color

Cooking

- Pureed fruits and vegetables to be made into leather – stops enzyme action, far superior to leathers made of raw fruits and vegetables

Antioxidant Dips

- Prevent natural browning, especially in fruit
- Soak cut fruit in solution of ascorbic acid and water (6000 mg Vitamin C tablets, crushed or 2 teaspoons powdered or crystalline ascorbic acid in 1 quart cool water or use commercial anti-oxidants like “Fruit Fresh” according to package directions).
- Soak cut fruit in fruit juice high in Vitamin C – flavor of juice will affect dried fruit

Sulfuring

- Sulfur and sulfur dips are more effective than blanching in preventing browning
- Sulfuring is not recommended due to extreme allergic reactions in some people
- Sulfur corrodes the metal parts of dehydrators

Heat treatment for jerky

- Heating meat strips in marinade before drying destroys dangerous microorganisms
- Marinating draws juices from meat, speeding drying, and tenderizing meat
- Heating dried jerky strips in an oven at 275° F for 10 minutes destroys dangerous microorganisms (pasteurization).

Drying procedures

- Arrange pre-treated food in single layers on trays
- Pieces should not touch one another
- Follow drying times for specific foods
- Exact time depends upon ambient temperature and humidity, size, thickness and number of pieces dried at one time
- Rearranging food on trays or repositioning of trays in the dehydrator is usually necessary for uniform drying

Testing for dryness

- Fruits – pliable, but not sticky or tacky, no visible moisture when squeezed
- Vegetables – leathery or brittle
- Herbs – brittle
- Fruit and Vegetable leathers – chewy, leathery consistency, easily peeled from tray
- Jerky – chewy and leathery, should crack, but not break apart when bent

Preparing food for storage

Conditioning

- Evenly distributes moisture left in food after drying
- Improves storage, decreases spoilage by mold
- Properly dried fruits, herbs, and seeds are usually conditioned because they contain more water than properly dried vegetables. Properly dried vegetables and jerky do not need to be conditioned.
- Place cooled, dried food in 1 to 2 cup plastic or glass containers 2/3 full, cover.
- Shake or stir contents daily for 7 to 10 days, checking for moisture condensation and spoilage.
- If moisture condensation appears, return food to drying trays for further drying.
- Discard food that has mold or other signs of spoilage.

Pasteurizing

- Insures destruction of insects and insect eggs in dried food not previously heat treated by blanching or cooking
- Pasteurize fruit for 15 minutes in a pre-heated 175° F oven.
- Pasteurize vegetables for 10 minutes in a pre-heated 175° F oven.
- Pasteurize jerky for 10 minutes in a pre-heated 275° F oven.
- Living pests are also destroyed at 0° F for a minimum of 48 hours.

Packaging & storing

- To prevent contamination, package food as soon as it is cool.
- Package in glass jars, food grade plastic freezer containers, plastic freezer storage bags, or heavy duty foil covered with a plastic bag to reduce punctures.
- Store in a dark, cool, dry place. Food stored at 60° F or below will keep one year, stored at 80° – 90° F food will deteriorate within several months. For longer storage, freeze.

Using dehydrated food

- Fruit, leather, and jerky can be eaten as is.
- Dried herbs enhance flavor in any recipe.
- Dried fruit may be rehydrated for use in recipes – soak in hot water for faster rehydration.
- Dried vegetables may be simmered in soups, casseroles and stews to desired degree of firmness.
- Tomato leather may be rehydrated to be used for sauce.
- Meat jerky may be added to soups, stews and casseroles.

Possible problems

- Case hardening – a crust forms on the outside of food and moisture cannot escape. Caused by drying at too high a temperature.
- Browning – can be prevented by using a pre-treatment. Food is safe to eat.
- Mold – caused by food not dried enough or not stored properly so that moisture was re-absorbed by food. Discard, not safe to eat.
- Sugar crystals – often happens with over-ripe fruit. Safe to eat, will dissolve if cooked.

Drying methods that should not be used in New York State

1. Sun Drying

Sun drying consists of placing the food in the sun out of doors, covered with a cheese cloth or nylon netting to help prevent insect contamination. Sun drying of foods is not recommended in New York State because the weather is not conducive to outdoor drying. The humidity is usually over 60%, and the necessary 85° F days are usually few. The food must be rotated and turned to promote even and thorough drying and this is very time consuming.

Because drying food in the sun can take 4 or 5 days, spoilage will occur during the drying process, especially of low acid foods. Only high sugar, high acid foods like fruits should be attempted. You are at the mercy of the weather. If it suddenly begins to rain or the humidity increases, your hours of labor and the cost of the fruit will be lost. Sun drying is less sanitary than drying in a dehydrator or oven. Sun dried foods have lower quality and nutritional value than those dried under controlled conditions as in a dehydrator. Insect contamination is a large problem.

2. Solar Drying

Solar drying is a slight improvement on sun drying, but still not recommended in New York. Solar dryers include features to boost the temperature such as reflecting aluminum foil or glass, vents at either end of the box to facilitate air movement, plastic covers to prevent rain from dampening the food, and vent screens to keep the insects off the food. The food and the drier must be rotated and turned to promote even and thorough drying and this is time consuming.

3. Car Drying

Car drying is not recommended. Besides having many of the same disadvantages as sun drying, the food odor will permeate the car interior, and will be very difficult to remove.

4. Clothes Dryer Food Drying

Drying food in the clothes dryer is not recommended for obvious reasons like sanitation, odor, and food safety.

Drying Study Questions

1. Why is sun drying not appropriate for New York State?
2. What may be dried in a microwave oven?
3. What three features should a dehydrator have to produce a quality dried product?
4. What is the purpose of a solid drying tray?
5. Does lean meat or marbled meat dry and store best? Why?
6. For even drying, how thick should foods be cut?
7. Describe four methods of pre-treating fruits or vegetables before drying.
8. Why should meat jerky be pasteurized after drying? How is this done?
9. Why should dried fruits, herbs and seeds be conditioned after drying? Describe the process.
10. In what temperature range will most dried foods keep in good condition for a year?