



Drying Project Manual

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4-H Home Food Preservation Series

The home food preservation series contains four manuals:

Freezing for ages 8–18

Drying for ages 8–18

Boiling water canning for ages 8–18

Pressure canning for ages 14–18

The manuals may be used by anyone in these age groups regardless of their prior knowledge of home food preservation.

Each manual lists the objectives for the project, and each activity includes a short lesson followed by hands-on activities and questions for further learning. In addition, each manual includes an achievement program to help youth identify their goals and keep track of their accomplishments.

These manuals were written using USDA food preservation guidelines. When preserving food at home, be sure to always follow current USDA canning recipes and guidelines. Contact your local Extension office for a list of these resources.

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University of Idaho

Swanson, Marilyn. 2009. *Drying Fruits and Vegetables*. PNW 397. Moscow, ID: University of Idaho Extension.

Resources

So Easy to Preserve, University of Georgia

<http://www.soeasytopreserve.com>

Ball Blue Book Guide to Preserving, 2011 or most current edition

Drying Fruits and Vegetables, PNW 397

<http://www.cals.uidaho.edu/edComm/pdf/PNW/PNW0397.pdf>

How to Dry Foods, by Deanna DeLong
Penguin Group USA, 2003

Ball website

<http://www.freshpreserving.com>

National Center for Home Food Preservation website

<http://www.uga.edu/nchfp>

Abbreviations

tsp, TSP = teaspoon

tbsp, TBSP = tablespoon

lb = pound

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Notes to project helper

This manual is for youth who want to learn about home food preservation. They can't do it without your help. You play a key role in helping them learn the basic information, skills, and safety practices behind food preservation. With your help they will set goals, find resources, and evaluate their own progress as they complete this manual.

Your responsibilities

- Become familiar with the material in this book.
- Assist youth in selecting and completing food preservation activities appropriate for their skills.
- Guide youth through thinking about why something happens or why it doesn't.
- Encourage youth to complete difficult tasks to expand their skills.
- Help youth learn about their strengths and weaknesses.
- Help youth evaluate the quality of their completed activities. Questions at the end of each activity will help youth think through the steps in the project and how to apply their new skills in their everyday lives.
- Be an example with kitchen and food safety rules.

Using experiential learning

Experiential learning is the process of "do, reflect, apply." It is an inquiry-based approach to learning. Rather than being provided with information, learners experience, share, process, generalize, and apply what they are learning.

Do. Experience the activity, perform, do it. This could be a group activity or experience. It involves doing, it may be unfamiliar, and it pushes the learner to a new level.

Reflect. Share reactions and observations. Learners talk about their experiences while doing the activity. They share their reactions and observations and freely discuss their feelings.

Apply. Generalize to connect the experience to real-world examples. Learners identify general trends and real-life examples of when they could use what they have learned.

Developing life skills

The Iowa State Life Skills Model helps identify the life skills that youth attain through the experiential learning process. The life skills targeted in this manual include:

Head

- Wise use of resources
- Planning/organizing
- Goal setting
- Critical thinking

Heart

- Communication

Hands

- Marketable skills
- Self-motivation

Health

- Healthy lifestyle choices
- Disease prevention

Drying foods basics

Project objectives

- Learn how to safely dry foods to maintain top quality
 - Learn how to use foods you dried in healthy recipes
 - Show others how to preserve foods by drying
-

Why dry foods?

Drying is the oldest method of preserving food. The early American settlers dried foods such as corn, apple slices, currants, grapes, and meat. In 1795, the first food dehydrator was introduced by the French. During the Great Depression of the 1930s, people could not afford or didn't have canning equipment, so foods were dried.

Drying is an excellent way to preserve foods that can add variety to meals and provide delicious, nutritious snacks. It allows you to choose the best, tastiest varieties you can buy or pick fresh from your garden. With the renewed interest in gardening and natural foods, and because of the high cost of commercially dried products, drying foods at home is becoming popular again. The foods you dry yourself cost a lot less than the ones you purchase at the store. One of the biggest advantages of dried foods is that they take much less storage space than canned or frozen foods.

Drying is very simple and easy to learn. However, it does take time and a lot of attention. Although there are different drying methods, the guidelines remain the same for all of them.

How drying preserves foods

Microorganisms and enzymes that spoil food and make it unsafe to eat need water to be active. Certain microorganisms are present in all foods. When they are exposed to warm temperatures and water, which is naturally present in foods, they multiply and the food spoils. Drying works as a preservation method simply by depriving these microorganisms of water. If sufficient water is removed from the food, they

cannot multiply and the food is preserved. Dried foods keep well because the moisture content is so low that spoilage organisms cannot grow.

Increasing the temperature of food makes its moisture evaporate. Air moving around the food carries the moisture away. Controlling temperature and air circulation prevents food from spoiling during the drying process. The temperature is very important. You do not want the temperature so hot that you cook the food; you just want to dry it. Also, if the temperature is too high, the food will case harden; in other words, the outside layer of the food dries and hardens, creating a hard shell on the food that traps moisture inside, allowing the food to spoil. On the other hand, if the temperature is too low or the humidity is too high, the food will dry too slowly, allowing the growth of microorganisms.

Nutritional value of dried foods

Dried fruits are a good source of energy because they contain concentrated fruit sugars. Fruits and vegetables can contain large amounts of vitamins and minerals.

Drying, like all methods of preservation, can result in the loss of some nutrients. For most foods, the nutritional value retained by drying is about the same as with freezing. Drying has a lower heat exposure than canning and therefore destroys fewer vitamins. Using a pretreatment for apples, peaches, and pears lessens the loss of vitamins A and C. Fiber and carbohydrates are not affected by drying. Neither are the minerals, such as potassium or magnesium, in some fruits. Minerals, however, may be lost during rehydration if soaking water is not used. Iron is not destroyed by drying.



Equipment for drying foods

Equipment	Use
Dry measuring cups	Used to measure dry and solid ingredients. They usually come in a nesting set of 1 cup, ½ cup, ⅓ cup, and ¼ cup.
Liquid measuring cups	Clear measuring cups used to measure liquids. You can see through the cup to measure, and there is headspace.
Measuring spoons	Used to measure dry and liquid ingredients. They usually come in a nesting set of 1 tbsp, ½ tbsp, 1 tsp, ½ tsp, and ¼ tsp. When you measure liquid ingredients, measure carefully to avoid spills.
Sharp knives and cutting boards	Used to cut food to desired size. Wash knives and cutting boards after each use in warm, soapy water.
Potholders	Used to protect hands when working with hot pans.
Rubber spatula	Used to scrape the sides of bowls or pans. You can use the flat side to level dry or solid ingredients when measuring.
Large pans	Heavy-duty pans are best for cooking. Don't use aluminum pans.
Long-handled spoons	Choose spoons that are tall enough that they will not fall down into the ingredients.
Mixing bowls	Made of pottery, glass, metal, or plastic, they come in different sizes.
Colander	Used to drain foods after washing.
Timer	For timing food preparation and processing.
Dehydrator	Produces the best-quality dried products and is the most popular drying method. A variety of electric dehydrators are available.
Airtight storage containers	Containers that you can eliminate air from are best.
Food chopper, blender, or food processor	Equipment that will chop, blend, and puree items. These optional items can cut back on preparation time. Handle them under the supervision of an adult.
Labels, permanent markers	Used to identify the type of food, pretreatment step, and date.
Double boiler	Used to cook fruit leather before drying.
Cookie sheet or jelly roll pan	Used for oven drying.
Blanching basket	Used for blanching vegetables before drying.
Freezer bags and freezer jars	Used for safely storing dried foods for an extended period of time.
Jars and lids	Mason type, threaded, home-canning jars with two-part lids. Recommended sizes: ½ pint, 1½ pint, quart, and ½ gallon (only for juice).
Peeler	Utensil used to remove the skin from vegetables.
Scale	Used to weigh fruits and vegetables for preserving.

Methods of drying food

There are several methods of drying foods. These methods are dehydrator, oven, sun, and solar. These methods are explained in this section. We will look at the advantages and disadvantages of each one.

Dehydrator drying. Dehydrators yield a better-quality dried product than any other method of drying and are the most popular method of drying. A dehydrator should have a heat source, a thermostat, and some method of air circulation.

Advantage: Good-quality product, not dependent on the weather, and does not tie up the oven. Foods can be dried on a 24-hour basis.

Disadvantage: The cost of energy used, which is very reasonable.

Oven drying. The oven drying method can be used to dry small amounts at a time.

Advantage: There is little or no investment in equipment, and you don't have to depend on the weather.

Disadvantage: Drying foods in an electric oven has been found to be 9–12 times as costly as canning. The lack of a fan to provide air circulation results in slower drying and poorer-quality products, as compared to using a dehydrator. Food is usually more brittle, darker, and less flavorful than that dried in a dehydrator. Oven drying also takes two or three times longer than drying in a dehydrator.

Sun drying. Sun drying depends on the temperature and the relative humidity outside. Sun drying can be used when the temperature is around 90°F, with low humidity and low air pollution.

Advantage: Low cost; only investment is netting, drying trays, and the fruits or vegetables. Another advantage is the sun's sterilizing effect; ultraviolet rays may slow the growth of some organisms.

Disadvantage: Sun drying can be done only when the temperature is high and the humidity is low. It takes more time to dry in the sun than in a dehydrator.

Solar drying. Solar drying is like sun drying, only better. The sun's rays are collected in a solar box, so

the drying temperature is higher. If you do not want to buy a solar box, you can use the back window ledge of an automobile where the sun shines through. Crack the windows slightly to allow air flow so temperatures do not get too hot. Also, remember to cover the trays with netting to keep bugs out.

Advantage: Shortened drying time as compared to sun drying.

Disadvantage: Solar drying units are very expensive. Many areas do not have a suitable climate for this method. Dependable solar dehydration of foods requires 3–5 consecutive days when the temperature is around 95°F and the humidity is very low.

Drying fresh fruits

Selecting fruits for drying

Some fruits are good for drying, and some are not. The following fruits dry well:

- Apples
- Grapes
- Blueberries
- Huckleberries
- Cherries
- Peaches
- Cranberries
- Pears
- Figs
- Plums

Fruits such as blackberries, cantaloupe, oranges, watermelon, and rhubarb do not dry as well.

Preparing fruits for drying

For a good-quality product, fruits must be prepared for drying as soon as possible after harvesting. Follow these steps.

1. Select good-quality, fresh, fully ripe fruit.
2. Prepare fruit soon after harvesting. The less time between garden and drying, the better the nutritional value, texture, and flavor will be.

Activities

1. Let's Make Trail Mix

Let's prepare some dried fruits for our trail mix. Making trail mix is easy and fun and you get to choose what goes in it. Consider what tastes you want to add to your trail mix. Different fruits and ingredients create different tastes.

For this activity, you can dry your fruits in a dehydrator or conventional oven.

Procedure if using dehydrator: Prepare fruit for drying according to instructions and the drying guidelines for fruit chart on pages 16-19. Arrange your fruit in a single layer on a dehydrator tray. It is important to dry the fruit quickly at first to eliminate the growth of bacteria. If you can control the temperature on your dehydrator, start at 140–150°F and then turn it down to 130° or 140°F after 2–3 hours.

Remember, factors that affect drying include:

- The type of food you are drying
- How thick or thin you slice your fruit
- How well air circulates in and out of the dehydrator
- The temperature and humidity where you live

To check your fruit, remove one slice and let it cool to room temperature. Check the guidelines for drying fruits chart on page 19 to see if it is done. Condition fruit before use.

Mix ¼ cup of your dried fruit in a bowl with ¼ cup of any of the following: rice crackers, cereal squares, granola, cashews, mini-pretzels, cheese crackers, almonds, walnuts, sunflower seeds, cereal O's, raisins.

Store ½-cup servings of your trail mix in plastic zipper-type bags. Write down your own special mixture recipes. Trade trail mixes with friends.



Journaling

What fruits did you dry for your trail mix?

What challenges did you have with this activity?

What would you do differently next time? Why?

2. Let's Make Fruit Leather

Make your fruit leather following the directions on pages 20 and 21. Try mixing different flavors of fruits. Canned fruits, such as applesauce, can be mixed with more expensive fresh fruits to help stretch the fruit concentrate and soften the flavor of sharp-tasting fruits such as cranberries. The addition of applesauce to juicy fruits improves handling and texture and also eases drying.

You might want to try adding spices or flavorings such as allspice, cloves, cinnamon, ginger, mint, nutmeg, or pumpkin pie spice. Start with just a pinch of spice or ¼ tsp per quart of puree.

You may want to add dried pieces of fruit in your leather to add some extra texture and variety to your fruit rolls. Bits of dried cherries, dried strawberries, raisins, or dried mango work well.



Journaling

What kind of fruit leather did you make and what, if any, extra flavoring or spices did you add?

What challenges did you have with this activity?

What would you do differently next time? Why?

3. Let's Make a Berry Cobbler

You can use dried fruit in many recipes. Use chopped dried fruit or whole dried berries or cranberries instead of raisins or nuts in cakes, quick breads, and cookies.

To soften the dried fruit and make it more chewable, you can plump it before adding it to a recipe: cover it with boiling water, let it stand for 5 minutes, and then drain. When making cobblers that require you to soak the berries for 3–4 hours, this step is not needed.

Use your imagination with the Dried Berry Cobbler; you can use blueberries, cranberries, gooseberries, or other berries that you have dried. You might even want to try mixing two of your dried berries.

Procedure for filling: Pour boiling water over the berries and let them soak for 3–4 hours. Place soaked berries and liquid in a shallow baking dish. Combine sugar and tapioca; sprinkle over the berries.

Procedure for batter: Cream together butter and sugar. Add beaten egg. Thoroughly mix flour, baking powder, and salt. Add the flour mixture to the butter mixture $\frac{1}{2}$ cup at a time, alternately with the milk.

Cover the berries with batter and bake 30 minutes at 400°F.

RECIPE: COBBLER FILLING

INGREDIENTS:

2 CUPS DRIED BERRIES
2 CUPS BOILING WATER
2 TBSP TAPIOCA
1 TO 1½ CUPS SUGAR, DEPENDING ON TARTNESS OF THE BERRIES

RECIPE: COBBLER BATTER

INGREDIENTS:

¼ CUP BUTTER OR MARGARINE
½ CUP SUGAR
1 EGG, WELL BEATEN
1½ CUPS FLOUR
2 TSP BAKING POWDER
½ TSP SALT
½ CUP MILK



Journaling

What dried fruit or fruits did you use in your cobbler?

What challenges did you have with this activity?

What would you do differently next time? Why?
