Drying
Project Manual

RHEA LANTING, Extension Educator, University of Idaho Extension, Twin Falls County
GRACE WITTMAN, Extension Educator, University of Idaho Extension, Cassia County
DONNA R. GILLESPIE, Extension Educator, University of Idaho Extension, Minidoka County

Healthy Lifestyles
Home Food
Preservation Series

PNW 651 A Pacific Northwest Extension Publication

NATIONAL
PEER REVIEWED

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.

Acknowledgments

Many colleagues have taken time to review the curriculum and conduct pilot tests. A special thanks goes out to Extension staff, educators, and specialists at University of Idaho, Washington State University, Oregon State University, and Colorado State University.

Special acknowledgments go to the following authors and universities for use of their material:

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

Published and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914, by University of Idaho Extension, the Oregon State University Extension Service, Washington State University Extension, and the U.S. Department of Agriculture cooperating.

Published September 2013

Contents

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

My plans

Use this page to help you plan how to finish this manual.

- Select your helper and write down his or her contact information.
- Set goals for each year.
- Complete the number of activities required by your state each year.
- Complete a presentation or demonstration each year.

Project helper: _____

Contact information: _____

My achievement program

Do at least four activities each year. You can also make up your own activities.
Ask your project helper to initial each activity after you've completed it.

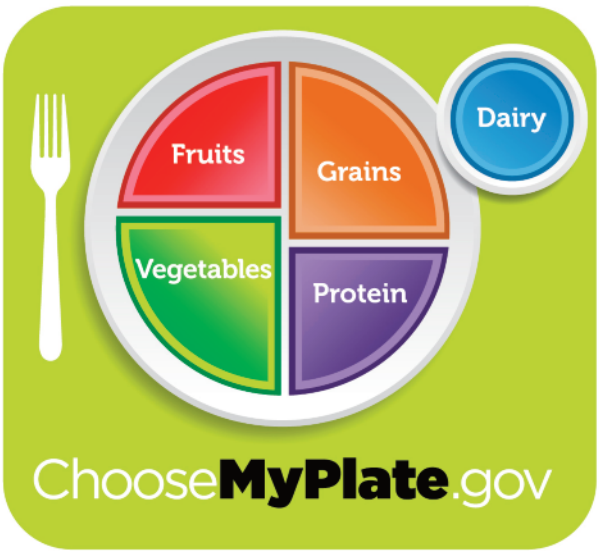
My activities		
Activities	**Date completed**	**Helper's initials**

Exploring MyPlate

10 tips for healthy eating

Learning about the nutrients that your foods contain allows you to make the best choices for healthy eating. There are many foods to choose from, but some of them are better choices than others. Making food choices for a healthy lifestyle can be as simple as using these 10 tips:

1. Balance your calories. To balance your calories you need to know how much food you eat and how much exercise you do each day. Find out how many calories you need in a day as a first step in managing your weight. Go to *www.ChooseMyPlate.gov* to find your calorie level.
2. Enjoy your food, but eat less. Take the time to fully enjoy your food as you eat it. Eating too fast or when your attention is elsewhere may lead to eating too many calories.
3. Avoid oversized portions. Use a smaller plate, bowl, and glass. Portion out foods before you eat.
4. Eat more vegetables, fruits, whole grains, and fat-free or 1% milk and dairy products. Make these foods the basis for meals and snacks.
5. Make half your plate fruits and vegetables. Choose red, orange, and dark-green vegetables like tomatoes, sweet potatoes, and broccoli along with other vegetables. Add fruit to meals as part of the main meal or as side dishes or dessert.
6. Switch to fat-free or low-fat (1%) milk. They have the same amount of calcium and other essential nutrients as whole milk but fewer calories and less saturated fat.
7. Make half your grains whole grains. Eat a whole-grain product instead of a refined product. For example, eat whole-wheat bread instead of white bread and brown rice instead of white rice.



8. Cut back on foods high in solid fats, added sugars, and salt. They include cakes, cookies, ice cream, candies, sweetened drinks, pizza, and fatty meats like ribs, sausages, bacon, and hot dogs. Use these foods as occasional treats, not as everyday foods.
9. Compare sodium in foods. Use the Nutrition Facts Label to choose lower-sodium versions of foods like soup, bread, and frozen meals. Select canned foods labeled "low sodium," "reduced sodium," or "no salt added."
10. Drink water instead of sugary drinks. Cut calories by drinking water or unsweetened beverages. Soda, energy drinks, and sports drinks are a major source of added sugar and calories in American diets.

Food groups

A healthy meal starts with more vegetables and fruits and smaller portions of proteins and grains. Think about how you can adjust the portions on your plate to get more of what you need without too many calories. And don't forget the dairy. Make it the beverage you drink with your meal or add fat-free or low-fat dairy products to your plate.

Grains. Grains like wheat, rye, oats, and rice are used to make bread, cereal, and pasta. Foods from the grains group have carbohydrates. Carbohydrates are fuel

your body needs. Whole grains are higher in fiber than refined grains. Look for whole wheat or other whole grains on the ingredient label. Half of the foods you eat from the grains group should be whole grains.

Vegetables. Vegetables provide several vitamins and minerals your body needs. Eat a variety of vegetables every day, including cooked dry beans and peas. Vegetables can be dried, canned, frozen, or fresh. Vitamin A is found in dark-green vegetables such as broccoli and spinach and in dark-yellow and orange vegetables such as carrots and sweet potatoes. Vitamin A keeps the cells in your body healthy to protect you against infections. Vitamin A also aids in the growth of healthy skin, bones, and teeth.

Fruits. Fruits provide vitamins and minerals. Fruits can be dried, canned, frozen, or fresh. Choose whole fruits or pieces of fruit. Oranges, grapefruit, strawberries, and melons have vitamin C, which helps your body to heal and resist infections and helps your body to absorb the iron in the food you eat. It is also needed for healthy teeth, gums, and blood vessels. Deep-yellow fruits like apricots and cantaloupe have vitamin A.

Oils. We do need some oils for good health. Get your oils from fish, nuts, and liquid oils such as corn oil, canola oil, or olive oil. Foods that are high in fat include chips, fries, snack cakes, cookies, and candy.

Dairy products. Milk provides calcium to keep your bones and teeth strong. Milk and foods made from milk are the best sources of calcium.

Protein foods. Meats and beans provide iron and protein for your body. Iron moves oxygen throughout your body in your red blood cells. Protein promotes the growth and repair of body tissues. Foods in this group include meats, poultry, fish, eggs, beans, nuts, and peanut butter. Meats can be frozen, home canned, or dried as jerky.

When you eat a food from the protein group, it should be lean. That means it doesn't have much fat in it. Baking, broiling, or grilling are the best choices for cooking protein foods, rather than frying, because they do not add fat to the meat.

MyPlate worksheet

For 1 day keep track of all the foods you eat and how much of them you eat on the MyPlate Worksheet for Kids (next page). First, write all your food choices in the left-hand column. Then, list each food choice in its food group. For example, if you had a banana for breakfast, list it in the fruits group. If you drank milk, list it in the dairy products group, and so on. Now, add up your total for each food group. Compare your totals to the goals for your age and gender. (See Dietary Guidelines for Youth, page 11.)

Remember to record how many minutes of physical activity you completed. Physical activity helps you to maintain a healthy weight and prevent excess weight gain. Try to get 60 minutes each day.

You can use this worksheet as a selected activity for more than 1 year. It is a good idea to track the foods you eat on a regular basis to check and see how you are doing.

Answer the following questions:

Q. What food groups were lacking?

_____

_____

Q. Do you need to eat less of any food group?

_____

Q. What changes could you have made on this day to eat better?

_____

_____

_____

Q. List two goals for yourself to improve your eating.

_____

_____

MyPlate worksheet for kids.

Check how you did yesterday and set a goal for tomorrow. Some foods don't fit in any group. These "extras" may be mainly fat or sugar. Limit your intake of these foods. Star all the home-preserved foods.

Write in your choices from yesterday	Food and activity	Goal (based on 1,800-calorie pattern)	List each food choice in its food group. Star the home-preserved foods	Estimate your total
Breakfast:		**6 ounce equivalents** 1 ounce equivalent is about 1 slice bread; 1 cup dry cereal; or ½ cup cooked rice, pasta, or cereal		**____ounce equivalents**
Lunch:		**2½ cups** Choose from dark-green, orange, starchy, or other veggies, including dry beans and peas		**____cups**
Snack:		**1½ cups** Choose from fresh, frozen, canned, or dried. 1½ cups fresh is equal to ¾ cup dried		**____cups**
Dinner:		**3 cups** 1 cup yogurt or 1½ ounces cheese = 1 cup milk		**____cups**
Physical activity:		**5 ounce equivalents** 1 ounce equivalent is 1 ounce meat, chicken, turkey, or fish; 1 egg; 1 tbsp peanut butter; ½ ounce nuts; or ¼ cup dry beans		**____ounce equivalents**
		At least **60 minutes** of moderate to vigorous activity a day or most days		**___ minutes**

How did you do yesterday? ❍ Great ❍ So-so ❍ Not so great

My food goal for tomorrow is: _____

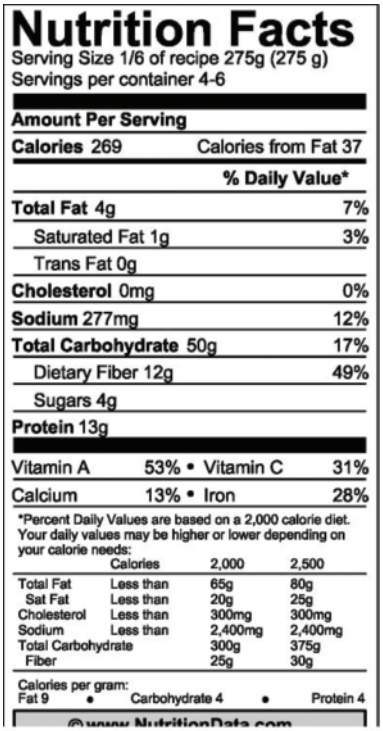
My activity goal for tomorrow is: _____

Reading food labels

When you completed your Choose MyPlate Worksheet, did you find that you were not eating enough of the right foods?

It is not always easy to know the amount of food in a serving. For example, how many crackers are in a serving? How much cereal do you pour in a bowl for a serving from the grains group? The answers are easy if you know where to look.

Most foods in the grocery store must have a nutrition label and list of ingredients. Look for the Nutrition Facts Label on the food package or container. This label shows the serving size, the number of servings in the package or container, and other nutritional information. The list of ingredients is on the label elsewhere.



Nutrition Facts

Serving Size 1/6 of recipe 275g (275 g)
Servings per container 4-6

Amount Per Serving	
Calories 269	Calories from Fat 37
	% Daily Value*
Total Fat 4g	7%
Saturated Fat 1g	3%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 277mg	12%
Total Carbohydrate 50g	17%
Dietary Fiber 12g	49%
Sugars 4g	
Protein 13g	

Vitamin A	53%	• Vitamin C	31%
Calcium	13%	• Iron	28%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Serving size. The place to start when you look at the Nutrition Facts Label is with the serving size. Just below that is the number of servings in the package or container. The Nutrition Facts Label at left shows that a serving size is ⅙ of the recipe. A recipe in this case would include the entire can plus additional water added as directed. This can of chili contains 4–6 servings.

Calories. Calories provide a measure of how much energy you get from a serving. In this can of chili there are 269 calories in one serving.

% daily value. The % daily value (% DV) is the amount of a nutrient in one serving compared with dietary recommendations.

Q. What is the % DV for total fat in the can of chili?

_____

_____

We should limit our intake of total fat, cholesterol, and sodium. Look for foods low in saturated fats, trans fats, and cholesterol (5% DV or less is low, 20% DV or more is high). Most of the fats you eat should be polyunsaturated and monounsaturated fats. Keep total fat intake between 20% and 35% of calories.

Q. Is the % DV for saturated fat in the can of chili high, moderate or low?

_____

_____

Sodium. The Dietary Guidelines for Americans suggest that we need to lower our sodium intake to less than 2,300 milligrams per day to reduce the risk of high blood pressure. One teaspoon of salt equals about 2,300 milligrams of sodium. Most of the sodium we eat comes from processed foods, not from the saltshaker. When you preserve foods at home, you can control the amount of sodium you add to your product.

Ask yourself the following questions:

Q. How much sodium would you consume if you ate the whole can of chili? Figure that there are four servings in the can._____

Q. How much sodium is in one serving? _____

Q. Is the % DV for sodium in one serving high, moderate or low? _____

Sugars. Sugars are found naturally in fruits (fructose) and in fluid milk and milk products (lactose). The majority of sugars in typical American diets are added to foods during processing, preparation, or at the table. Dietary Guidelines for Americans suggest that we need to reduce the intake of calories from added sugars. In home food preservation, you can control the amount of added sugar in fruits and other products.

Fiber, vitamins, and minerals. Be sure to get enough potassium, dietary fiber, and vitamins and minerals. Remember that 5% DV is low and 20% DV or more is high.

Q. Is the calcium listed on the chili label high, moderate or low?_____

Going Further

You might want to collect your own label and answer the following questions:

Q. What is the food item? _____

Q. What is the serving size? _____

Q. How many calories are in the item per serving? _____

You may also want to collect several brands of the same food and compare the labels. Compare cartons of fruit juice and fruit drink, or several boxes of dry cereal or energy bars.

How much should you eat?

ChooseMyPlate.gov or nutrition.gov gives you amounts of different foods that you should eat to stay healthy. It depends on your age, whether you are a girl or boy, and how active you are. Kids who are more active burn more calories, so they need more calories. The Dietary Guidelines for Youth table gives estimates (page 11).

The following tips and measurements will help you use the table.

Grains. Grains are measured in ounce equivalents. Eat 4–7 ounce equivalents every day, and remember that at least half of these should be whole grains. An ounce equivalent equals:

- 1 slice of bread
- ½ cup of cooked cereal, such as oatmeal
- ½ cup of rice or pasta
- 1 cup of cold cereal

Vegetables. Vegetable servings are measured in cups. Vegetables can be canned, dried, frozen, or fresh.

Fruits. Fruit is part of a healthy diet. Fruit can be canned, dried, frozen, or fresh. One-fourth cup of dried fruit is equal to ½ cup fresh fruit.

Dairy products. Calcium builds strong bones to last a lifetime, so you need to get these foods in your diet. Dairy products include milk, yogurt, and cheese.

Protein foods. These foods contain iron and lots of other important nutrients. These foods, like grains, are measured in ounce equivalents. An ounce equivalent equals:

- 1 ounce of meat, poultry, or fish
- ¼ cup cooked dry beans
- 1 egg
- 1 tablespoon of peanut butter
- A small handful of nuts or seeds

Dietary guidelines for youth: Amount to eat each day

Age group	Food group				
	Grains (ounce equivalents)	Vegetables (cups)	Fruits (cups)	Dairy products (cups)	Protein foods (ounce equivalents)
4–8	4–5	1½	1–1½	1–2	3–4
9–13 (girls)	5	2	1½	3	5
9–13 (boys)	6	2½	1½	3	5
14–18 (girls)	6	2½	1½	3	5
14–18 (boys)	7	3	2	3	6

Let's plan a menu

Planning a menu can be fun when you base it on MyPlate. Using the MyPlate guidelines we have talked about, determine how much food you should eat daily from each of the food groups. Then divide the total amount of food you should eat each day among three meals and one or two snacks.

Make your meals fun and interesting. Try to include a variety of foods to make the meal interesting and healthy; different colors and shapes of food that make the meal appealing to look at; different textures such as crunchy, soft, chewy, and liquid; different flavors such as spicy and mild; and both hot and cold foods.

Include foods from at least three or four of the five food groups at each meal.

Remember to include foods that you have made in your project. You might choose dried or canned fruits, frozen vegetables, salsa, or other canned products. You might want to include a snack of trail mix that you made in the drying manual.

If you want another challenge, plan all the meals for a week, including snacks. You might choose to rate the meals for texture, color, and taste. You might also want to compare the meals to MyPlate to see if you have provided the recommended number of servings for each food group.

Going Further

Organize your menus in a binder or file. You might choose to exhibit them at your fair as part of your food preservation project.

Meal 1:

_____
_____
_____
_____

Meal 2:

_____
_____
_____
_____
_____

Meal 3:

_____
_____
_____
_____
_____

Snack:

_____
_____

Snack:

_____
_____

Kitchen and food safety basics

Kitchen safety

Kitchens are safe! It's the people who work in kitchens who create problems. You can prevent problems by using equipment and utensils properly and by handling sharp items and hot foods and liquids carefully. When working in the kitchen, be aware of safety hazards and take precautions to prevent injuries or accidents by creating and maintaining a safe working environment.

Many common accidents happen in the kitchen, such as burns, cuts, and falls. While cooking should be fun, you need to follow a few basic rules:

- Don't be in a hurry. Accidents happen when you're in too much of a hurry.
- Always clean up spills. Serious injury can occur when someone falls on a wet floor.
- Never leave food unattended on the stove. Many fires develop while the cook is not paying attention to what is cooking.
- Don't use a towel in place of a hot pad. Always use potholders in both hands.
- Turn handles to the side and away from the edge of the stove.
- When cutting food, always cut away from you. Learn how to handle a knife properly.
- Never put a sharp knife or utensil in a sink of soapy water. Someone might put his or her hand in the sink and get cut.
- Don't leave a metal spoon in a pot that is boiling.
- When opening the lid on a steaming pan, always lift away from you. Steam can burn just as easily as boiling liquid.
- Don't use electrical appliances around the sink or water.
- Avoid loose clothing and flowing hair. If you have long hair, tie it back.

Food safety

- Wipe up spills when they happen.
- Wash hands with soap under warm water for at least 20 seconds. Dry hands on a disposable paper towel or a towel designated just for hands.
- Use clean towels and dishcloths.
- Never put a spoon in your mouth and then back in the food.
- Avoid cross-contamination by using separate cutting boards for meat and for fruits and vegetables.
- Keep all preparation and cooking surfaces clean.
- Thoroughly clean all dishes, equipment, and utensils with hot, soapy water after use.
- Follow the 2-hour rule. Never leave prepared foods on the counter for longer than 2 hours.

Food preservation safety

- Always use a current, tested recipe. Do not make up recipes as they have not been tested to make sure the product is safe to store and eat.
- Make sure to adjust for altitude when canning. Processing times or pressure must be adjusted on most recipes because they are written for people who live at sea level. Since water boils at lower temperatures as altitude increases, it is necessary to increase processing times or pressure to ensure the food is safe.
- Add acid (lemon juice or citric acid) to canned tomato products as a margin of safety.

  Lemon juice—1 tablespoon per pint, 2 tablespoons per quart

  Citric acid—¼ teaspoon per pint, ½ teaspoon per quart
- Be sure to use the correct equipment for each preservation technique.

  Boiling water canner for acid foods

  Pressure canner for low-acid foods

  Dehydrator for drying

  Freezer with plenty of space for freezing
- Preservation does not improve the quality of any food. Always use fresh, ripe, unbruised, high-quality produce for food preservation.

Types of food preservation

There are seven major methods of food preservation:

Refrigeration

- Slows the growth of microorganisms.
- Slows the action of enzymes.

Freezing

- Prevents the growth of microorganisms.
- Slows, but does not stop, enzyme action.

Canning

- Destroys the microorganisms that may be present in the food by exposing them to heat.
- Destroys yeasts and molds when food reaches 190°F.
- Pressure canning exposes foods to higher temperatures than boiling water canning, killing dangerous bacteria.
- Proper canning practices remove air from the jars, leaving a vacuum.
- Molds and some yeasts are unable to grow in a vacuum.

Sweetening and acidifying jellies and jams

- Added sugar and acid tie up free water and lower the pH of the food.

Pickling and fermenting

- Fermenting uses bacteria to produce lactic acid, which lowers the pH of the food.
- Added acid (fresh pack) reduces pH with vinegar.

Drying

- Prevents growth of microorganisms.
- Dried foods must be packaged in oxygen-proof and moisture-proof containers.

Salting

- Chemically bonds water, inhibiting growth of microorganisms.

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.

Types of dip for improving fruit quality and safety

Type of dip	For quality (to preserve fruit color and reduce vitamin loss)	For quality and safety (to enhance pathogen destruction)	Tests for dryness and drying time guidelines
Ascorbic acid	½ tsp per quart water	8 tsp per quart water	Leathery to crisp, no moist area in center (6–12 hours)
Citric acid[1]	100% pineapple, orange, lemon, or grapefruit juice	1 tsp per quart water	Springy, no moist area in center (24–36 hours for halves)
Sodium metabisulfite[1, 2]	1–3 tsp per quart water		Pliable to crisp (8–10 hours)
Sodium bisulfite[1, 2]	½–1 tsp per quart water		Shriveled, leathery (24–36 hours)
Sodium sulfite[1, 2]	1–2 tsp per quart water		Pliable, leathery (24–36 hours)
Syrup blanch	1 part sugar to 2 parts water		Leathery to crisp; dry at 110°F
Honey	1 part honey to 4 parts water		Shriveled (24–36 hours)

[1]Citric acid and sulfites can usually be obtained where winemaking or brewing supplies are sold.
[2]Be careful with sulfites! Some individuals are highly sensitive to sulfites. Sensitive individuals should not eat food treated with sulfites or prepare soaking solutions that contain sulfites.

3. Wash fruit.
4. Peel, slice, or cut fruit into smaller, equal size pieces for even drying.
5. Pretreating fruits is a personal preference. Pretreating some fruits before drying will reduce vitamin loss, flavor loss, browning, and deterioration during storage. Food safety is enhanced by use of some pretreatments that reduce pathogen activity during drying. Pretreatments include ascorbic acid and/or citric acid dip or sulfuring (see types of dip chart above). Fruits can be pretreated in a syrup solution.

Pretreating fruits for quality and safety

Decomposition from enzyme action during storage is less of a problem with fruits than it is with vegetables. Fruits have higher levels of sugar and acid, which counteract enzyme action. Although pretreating fruit is not necessary, you can use an ascorbic acid/citric acid dip, syrup blanching, a honey dip, or a sulfiting procedure.

Certain fruits such as apricots, pears, peaches, and some varieties of apples tend to discolor with drying. Pretreating those fruits can decrease browning during processing and storage and lower losses of flavor and of vitamins A and C.

Optional pretreatment dips for fruits include the following:

Ascorbic acid/citric acid dips. Ascorbic acid/citric acid dips are often used as a pretreatment for fruits. They prevent fruits such as apples, pears, peaches, and apricots from turning brown when cut and exposed to air. An ascorbic acid (another name for this is vitamin C) dip also increases the vitamin C content of the dried fruit. Vitamin C tablets can also be used.

To prepare the solution for prevention of browning, combine ½ teaspoon of ascorbic acid crystals or three crushed 500-milligram tablets of vitamin C in 1 quart of water. Approximately 1 quart of solution will treat 8 cups of fruit. Place the cut fruit in the solution and leave it in the solution for 5 minutes.

A more concentrated ascorbic acid solution is required to help destroy pathogens during drying. Refer to the types of dip chart for these instructions and leave the fruit in the solution for 10 minutes.

Pineapple juice or juice from citrus fruits such as lemons, oranges, or grapefruit may also be used as a pretreatment. These juices contain a mixture of citric and ascorbic acids. Citric acid does not prevent browning as well as ascorbic acid, but it's more effective at destroying harmful bacteria. Refer to the types of dip chart for preparing the pretreatment. Place fruit in the solution and soak for 10 minutes.

Syrup blanching. Prepare fruit for drying. Prepare a sugar syrup made with 1 part sugar and 2 parts water. You may use less sugar. Bring the sugar solution to a boil. Add the fruit, simmer for 5 minutes, and then drain the fruit. Place the fruit on drying trays and dry. This fruit is more like a candied fruit.

Honey dip. A honey treatment for fruit can be used to minimize browning and softening of light-colored fruit. Prepare the honey-water dip following the instructions in the types of dip chart. Dip the fruit in the honey solution, let it soak for about 5 minutes, and drain well. The fruit will have a slight honey taste.

Sulfiting. Sulfur dioxide treatments (sulfiting or sulfuring) are effective to prevent browning. Fruit flavor and storage life may also improve. Almost all commercially produced dried light-colored fruits, such as apples, pears, and apricots, are treated with sulfur compounds.

Be careful with sulfites! Some individuals, particularly those with asthmatic conditions, are highly sensitive to sulfites. During the drying process, most of the sulfites enter the air, leaving only a trace on the fruit. Nevertheless, this trace may cause severe allergic reactions in sensitive individuals.

Sensitive individuals should not eat food treated with sulfites or prepare soaking solutions using sulfites. If you use a sulfiting pretreatment when drying foods, be sure to say so on the label.

Prepare the sulfite solution and place cut fruit in the solution—about 10 minutes for sliced fruit and 30 minutes for halved fruit. Do not leave the fruit in the solution too long or the fruit will become mushy. Remove fruit and drain well. Fruit may be rinsed if you wish. Fruit that has been sulfited takes longer to dry because the fruit absorbs some water during soaking.

How to dry fruits in a dehydrator

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°F or 140°F after 2–3 hours.

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 (see the guidelines for drying fruit chart, page 19). Condition fruit before use.

Conditioning fruits

Some pieces of fruit will be a little more moist than others after drying, due to the size variation of the pieces of fruit or where they were located in the dryer; therefore, you need to condition fruits before long-term storage. Conditioning is a process used to distribute the moisture evenly in the fruit. It reduces the chance of spoilage, particularly from mold.

To condition, loosely pack cooled, dried fruit in plastic or glass containers to about two-thirds full. Cover the containers tightly. Shake them daily for about 2–4 days. The excess moisture in some places will be absorbed by the drier pieces. If you notice moisture forming on the container lid, place the fruit back in the dehydrator.

Drying canned fruits

Using canned fruits is a quick way to prepare fruit for drying. Drain the syrup, rinse the fruit, cut it into ½ inch slices, and then dry as usual. Drying will take longer than for fresh fruit, because the canned fruit will contain absorbed syrup. Dried canned fruit resembles candied fruit and can be used in similar ways. This works very well with last year's canned apricots.

Guidelines for drying fruits

Fruit	Selection and preparation (thoroughly wash all fruits)	Pretreatment[1]	Tests for dryness and drying time guidelines[2]
Apples	Peel (optional) and core. Cut into slices or rings about ¼ inch thick.	None, ascorbic acid/citric acid dip, syrup blanch, honey dip, or sulfiting	Leathery to crisp, no moist area in center (6–12 hours)
Apricots	Cut in half and pit. Fruits dry more rapidly if quartered or sliced.	Ascorbic acid/citric acid dip, syrup blanch, honey dip, or sulfiting	Springy, no moist area in center (24–36 hours for halves)
Bananas	Peel and slice ¼ to ½ inch thick, crosswise or lengthwise.	None or ascorbic acid/citric acid dip	Pliable to crisp (8–10 hours)
Blueberries/ Huckleberries	Remove stems.	None, or dip larger berries in boiling water to crack the skins	Shriveled, leathery (24–36 hours)
Cherries	Remove stems. Slice in half and remove pit, or pit and dry whole.	None or sulfiting	Pliable, leathery (24–36 hours)
Coconuts	Drain milk. Steam fruit 1 minute to loosen meat or pry meat out with a knife. Trim dark outer skin, and grate meat or slice in chunks.	None	Leathery to crisp; dry at 110°F
Cranberries	Remove stems.	Dip in boiling water to crack skins, or syrup blanch	Shriveled (24–36 hours)
Figs	If figs are small or have partly dried on the tree, they may be dried whole. Otherwise, cut in half. Dry with skin side down.	None or syrup blanch	Pliable, leathery, slightly sticky, no moist area in center (6–12 hours)
Grapes	Select seedless varieties.	Dip in boiling water 30 seconds to crack skins. Plunge in ice water to stop cooking. Drain on paper towels.	Pliable, leathery (12–20 hours)
Kiwi fruit	Remove outer skin. Slice ¼ inch thick.	None	Pliable, leathery
Papayas	Cut in half and remove seeds. Peel and slice.	None or syrup blanch	Pliable, leathery
Peaches	Peel and slice. Fruits dry more rapidly if quartered or sliced.	None, ascorbic acid/citric acid dip, syrup blanch, honey dip, or sulfiting	Pliable, leathery (24–36 hours for halves)
Pears	Peel, cut in half lengthwise, and core. Section or slice about ¼ inch thick.	None, ascorbic acid/citric acid dip, syrup blanch, honey dip, or sulfiting	Pliable. leathery (24–36 hours for halves)
Pineapples	Peel and remove thorny eyes; cut into ¼ inch thick slices.	None, or syrup blanch	Leathery but not sticky (24–36 hours)
Plums	Cut in half and pit. Fruits dry more rapidly if quartered or sliced.	None or sulfiting for light-colored fruit	Pliable, leathery (24–36 hours for halves)
Prunes	Cut in half and pit. Fruits dry more rapidly if quartered or sliced.	None	Pliable, leathery, a handful of properly dried prunes will fall apart after squeezing (24–36 hours for halves)
Rhubarb	Cut in 1 inch lengths.	None or blanch for 1–2 minutes	Very brittle, tough
Strawberries	Remove stems. Cut strawberries in half. Dry skin side down.	None	Pliable, leathery

[1]Be careful with sulfites! Some individuals are highly sensitive to sulfites. Sensitive individuals should not eat food treated with sulfites or prepare soaking solutions that contain sulfites.
[2]Drying times are guidelines only. Test food frequently for dryness according to the criteria described in the chart. Cool food before testing.

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

Making fruit leathers

Fruit leather is a pureed fruit that is dried in a thin layer and rolled into chewy fruit taffy. It makes a nutritious snack for lunch boxes, after-school treats, or to carry backpacking or anywhere.

Apples, apricots, berries (all kinds), cherries, nectarines, peaches, pears, pineapple, and plums make good fruit leathers. Many fruits can be combined with other fruits to make delicious combinations. For example, bananas can be combined with apples, berries, and many other fruits.

Fresh fruits in season make excellent fruit leathers; however, canned and frozen fruits also work well. Fruit leathers are a good way to use slightly overripe or bruised fruit that might otherwise be discarded. This is also a good way to use last year's canned fruit that might be starting to discolor.

Adding some applesauce to many fruit purees improves the texture of the dried product.

You can make uncooked or cooked fruit leather.

Uncooked fruit leather

1. Select ripe or overripe fruit or fruit combinations.
2. Wash fruit and cut away blemishes. Remove stones or pits. Remove larger seeds from berries, grapes, and tomatoes if you wish. Peel all tough-skinned fruits; peel others if you wish.
3. Cut fruit into chunks and place them in a food chopper, blender, or food processor.
4. Add 1 tablespoon lemon or other citrus juice per quart of yellow or light-colored fruit, if desired, for keeping fruit color.
5. Chop, grind, or blend the fruit into a thick puree. If the fruit has little juice, you may add several spoonfuls of water or fruit juice to obtain a uniform puree.
6. Add sugar, honey, or corn syrup to taste if you choose. Most fruits do not need any added sugar, because fruit tastes sweeter after being dried.
7. Add spices if you choose. Spices such as cinnamon, nutmeg, cloves, or allspice may be added to taste. Start with a small amount, such as ½ teaspoon per quart of pureed fruit. Remember, spice flavors are intensified when food is dried.
8. Use a dryer tray designed for fruit leather. You may also line a portion of a drying tray with lightly oiled heavy plastic wrap. Do not cover the entire tray, or the air will be unable to circulate to other trays. Pour the puree onto the lining wrap. Spread the puree to no more than ¼ inch thick almost to the edge of the plastic wrap. Approximately 2 cups of puree will cover a 12- by 17-inch drying tray.
9. You may sprinkle the puree with chopped nuts, seeds, or grated coconut if you wish.

For those who would like an extra measure of safety, heat the fruit puree in a microwave oven to 160°F before pouring it onto trays to dry. Stir it periodically during microwave heating to ensure the puree is heated all the way through. This pretreatment is especially important if the fruit for the leather has been gathered from the ground or if the leather will be eaten by people who are at greater risk for foodborne illness. These people include children, pregnant women, immunocompromised people, and elderly people.

Cooked fruit leathers (Double boiler method)

1. Select, wash, and prepare fruit as described for uncooked fruit leather.
2. Cut the fruit into slices or chunks and place them in the top of a double boiler.
3. Add water to the bottom of the double boiler. If you do not have a double boiler, you may use a small pan containing the fruit in a larger pan partially filled with boiling water. Cover the double boiler (or the pan containing the fruit) and steam the fruit for 15 minutes or until it is soft.
4. Follow steps 4–9 for uncooked fruit leather.

Fruit leather from canned fruit

Thoroughly drain home-canned or commercially canned fruit, last year's canned fruit, or baby food fruit (without tapioca). Follow steps 3 and 5–9 on page 20 for uncooked fruit leather. Since canned fruits have been heat processed to stop enzymatic action, you don't need to add ascorbic acid.

Drying and storing fruit leather

Dry fruit leather until the leather is sticky, generally 6–8 hours at 140°F. Properly dried fruit leather will be translucent and slightly tacky to the touch, but will still peel away from the plastic wrap. It should not be soft to the touch. When the leather is sufficiently dried, you will be able to pull it up. If it sticks to the tray in the center, it has not dried completely. If the fruit leather cracks or chips, it has dried too long. However, it is still edible.

The fruit leather can now be rolled and wrapped in plastic wrap or stored flat in sheets with plastic wrap separating the sheets. Place the wrapped pieces in an air-tight container in a cool, dark, dry place. You can also store fruit leather in the refrigerator or freezer.

Drying vegetables

Follow these steps for drying vegetables (see the guidelines for drying vegetables chart, page 22).

1. Select vegetables in prime condition.
2. Time from garden to dryer should be as short as possible.
3. Wash to remove dirt.
4. Peel, trim, core, cut, slice, or shred, keeping pieces about the same size or thickness.
5. Almost all vegetables should be blanched before drying. Vegetables deteriorate rapidly because of the presence of enzymes. Enzymes are destroyed by heat during blanching. There are two types of blanching:

   Hot water blanching—Vegetables are placed in a basket and submerged in boiling water for a specific time.

   Steam blanching —Vegetables are suspended above the boiling water in a colander or wire basket. Only steam is in contact with the food. This is the preferred method because there is less loss of water-soluble vitamins.
6. Blanched vegetables should feel and taste firm, but tender. They should be heated through but not be cooked as for eating.
7. Drain vegetables before drying. Blot with a paper towel if there is extra moisture.

Vegetables dry to a nearly waterless state; therefore, conditioning vegetables is not necessary.

Drying frozen vegetables

Frozen vegetables may be thawed, drained, and dried. Blanching was done before freezing, so is not needed.

Guidelines for drying vegetables

Vegetable	Selection and preparation (thoroughly wash all vegetables)	Pretreatment and blanching time guidelines[1]	Tests for dryness and drying time guidelines[1]
Beets	Select small, tender beets of good color and flavor, free from woodiness. Steam or boil them until cooked through. Cool, trim off the roots and crowns, and peel the beets. Cut into shoestring strips or into slices about ¼ inch thick.	Steam or boil until tender (25–30 minutes for small beets)	Tough, brittle (10–12 hours)
Broccoli	Trim and cut as for serving. Quarter stalks lengthwise.	Water or steam blanch (2–3 minutes in water, 3–5 minutes in steam)	Crisp (12–15 hours)
Cabbage	Remove outer leaves, quarter, and core. Cut into shreds about 1/8 inch thick.	Steam blanch (2–3 minutes)	Crisp (10–12 hours)
Carrots	Select crisp, tender carrots, free from woodiness. Wash; trim off the roots and tops. Cut into slices or strips about ¼ inch thick.	Steam blanch (3–4 minutes)	Tough, brittle (10–12 hours)
Cauliflower	Separate into flowerets. Cut large flowerets in half.	Water blanch (add 1 tbsp vinegar per 1 gallon water) (3–4 minutes)	Tough, brittle (12–15 hours)
Celery	Strip off leaves. Cut stalks into ¼ inch pieces. Stir occasionally during drying.	Water blanch (30 seconds to 2 minutes)	Crisp (10–16 hours)
Corn (cut)	Select tender, sweet corn. Husk. Steam on the cob for 5–10 minutes, or until milk is set. Cut from cob.	Steam blanch	Crisp, brittle (6–10 hours)
Green beans	Remove defective pods. Remove strings if necessary. Split pods lengthwise to hasten drying.	Water or steam blanch (2–3 minutes in water, 3–4 minutes in steam)	Brittle (8–14 hours)
Mushrooms	Slice off woody stems. Slice, or dry whole if small. Spread no more than ½ inch deep on trays. Use only commercially grown mushrooms.[2]	None	Crisp, brittle. Dry at 120°F
Okra	Use only young, tender pods. Cut ½ inch crosswise, slice, or split lengthwise. Spread no more than ½ inch deep on trays.	Water blanch (2–3 minutes)	Tough, brittle (8–10 hours)
Onions	Remove outer, discolored layers. Slice ¼ inch thick or chop.	None	Brittle, light-colored, feels like paper (3–9 hours)
Parsley and other herbs	No precooking is necessary. Hang bunches or whole plants in a dry, warm place. When dry, crush leaves and remove stems. When drying in a dehydrator or oven, keep temperatures below 120°F.	None	Brittle. Dry at 100°F (1–2 hours in a dehydrator)
Parsnips	Select crisp, tender parsnips, free from woodiness. Wash; trim off the roots and tops. Cut into slices or strips about ½ inch thick.	Water or steam blanch (2–3 minutes in water, 3–5 minutes in steam)	Tough, brittle

[1]Blanching and drying times are guidelines only. Test food frequently for dryness according to the criteria described in this chart. Cool food before testing.
[2]Only an expert can differentiate between poisonous and edible varieties.

Guidelines for drying vegetables, cont.

Vegetable	Selection and preparation (thoroughly wash all vegetables)	Pretreatment and blanching time guidelines[1]	Tests for dryness and drying time guidelines[1]
Peas	Select young, tender peas of a sweet variety. Shell. Stir frequently while drying.	Steam blanch quickly after shelling (2–3 minutes)	Hard, wrinkled, shatter when hit with a hammer (8–10 hours)
Peppers (green, red, or yellow)	Cut in ½-inch strips or rings. Remove seeds and "partitions." Spread rings two layers deep; spread strips no more than ½ inch deep.	None, or water or steam blanch (2–3 minutes water, 3–5 minutes in steam)	Tough, brittle (8–12 hours)
Potatoes	Peel; cut into shoestring strips 3⁄16 inch in cross section or slice about ¼ inch thick.	Rinse in cold water. Water or steam blanch, and rinse well. (5–6 minutes in water, 6–8 minutes in steam)	Crisp (8–12 hours)
Pumpkin, yellow	Chop into strips about 1 inch wide. Peel off rind; scrape off fiber and seeds. Cut peeled strips into pieces about ⅛ inch thick.	Water or steam blanch until tender (1 minute in water, 2–3 minutes in steam)	Tough to brittle (10–16 hours)
Soybeans	Blanch pods until beans are tender but firm. Shell.	Water or steam blanch	Shatter when hit with hammer
Spinach and other greens	Select young, tender leaves. Wash. See that leaves do not form wads when placed on trays. Cut large leaves crosswise into several pieces.	Water or steam blanch until wilted	Brittle
Squash (Hubbard or winter types)	Chop into strips about 1 inch wide. Peel off rind; scrape off fiber and seeds. Cut peeled strips into pieces about ⅛ inch thick.	Water or steam blanch until tender (1 minute in water, 2–3 minutes in steam)	Tough to brittle (10–16 hours)
Squash (summer, crookneck, scallop, zucchini, etc.)	Wash, trim, and cut into ¼-inch thick slices.	None, or water or steam blanch	Leathery to brittle (10–12 hours)
Tomatoes (meaty varieties)	Select tomatoes of good color. Steam or dip in boiling water to loosen skins. Chill in cold water; peel. Cut into sections not more than ¾ inch wide. Cut small pear or plum tomatoes in half.	None	Leathery to crisp (10–18 hours)

[1]Blanching and drying times are guidelines only. Test food frequently for dryness according to the criteria described in this chart. Cool food before testing.

Drying herbs

Many herbs can be dried very successfully. Herbs such as parsley, basil, chives, mint, oregano, dill, rosemary, sage, tarragon, and thyme work well. Herbs may be dried in a dehydrator or in a paper bag.

Follow these steps:

1. Use scissors to cut leaves and stems when gathering herbs. The leaves of most herbs should still be green and tender and should be harvested just before the plant begins to flower.
2. Wash and carefully roll leaves in a clean, dry towel to remove excess water.

   Dry in a single layer on a dryer rack. The dehydrator is the most efficient method and produces the highest quality dried herbs because it takes only 1–3 hours and has controlled temperature and good air circulation.
3. Small bundles of stems can be hung in a warm, dry place. The more sturdy herbs, such as rosemary, sage, thyme, and parsley, are the easiest to dry without a dehydrator. Tie them into small bundles and hang them to air dry. You might also tie the bundle in a brown paper bag with a few holes in it. When the herbs are hung upside down, the flavoring oils from the stems concentrate in the leaves. Then hang the bag to air dry in the kitchen, attic, or anywhere there is a warm, even temperature and good air circulation.
4. Herbs are dry when they crumble easily and are crispy. Stems should be brittle and break when bent. Leaves that are not completely dried will mold during storage. Drying usually takes 5–10 days.

   If drying leaves in a bag, check for dryness by opening the bag and feeling the leaves. If they are dry enough, roll the bag gently between your hands so the leaves will fall from the stems to the bottom of the bag.
5. When dried, place the herbs in airtight containers and store in a cool, dry, dark area to protect the color and fragrance.

Packaging and storing your product

Good packaging and storage techniques are critical. Packaging protects your dried food from oxygen, moisture, light, microorganisms, and pests. After you have checked foods and found them to be thoroughly dry and cool, pack them immediately for storage.

Packaging

Packaging and storage containers should be:

- Clean and dry
- Food grade or meant for use with food
- Sturdy
- Protective against light
- Airtight and moisture resistant
- Easily disposable or recyclable
- Easily opened and closed
- Durable
- Low-cost

Unfortunately, no single food container has all of these characteristics. Make your choice based on the type of dried food, your intended storage conditions and storage time. Glass, plastic, and metal (never galvanized steel) are used for packaging most dried foods. Plastic bags are suitable if they are easily opened and closed.

Labeling

Be sure to label each package of dried foods. Label with the type of food, the pretreatment step (if you did one), and date. Labels can be taped on the outside of a package, tied on with string, or inserted into a clear glass or plastic package.

Storing dried foods

The length of time you can store your dried foods depends on the following conditions:

- The type of food
- The storage location

- Factors related to the drying process, such as pretreatment and final level of moisture in the dried food
- Packaging of the dried food

An ideal place for storage of dried foods is a cool, dark, and dry area. Dark areas are ideal because light fades fruits and vegetables and decreases their vitamin A and C contents.

Storing dried foods in the refrigerator or freezer takes up little space, and there are no problems with mold or insects. This method also maintains high food quality.

If stored at room temperature, the most common type of spoilage is mold growth. Molds can grow on foods that are not completely dry and in foods that absorb water when they are packaged or stored in moist conditions. *Remember: don't eat moldy foods, because some toxic molds can grow at room temperature. Discard all of the contents of a package if you see mold.*

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 ½ 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?

_____

_____

_____

_____

_____

4. Let's Make Peanut Butter and Fruit Spread

RECIPE: PEANUT BUTTER FRUIT SPREAD

INGREDIENTS:

- 1 CUP SMOOTH OR CRUNCHY PEANUT BUTTER
- 2 TBSP BUTTER AT ROOM TEMPERATURE
- 1/3 CUP FINELY CHOPPED DRIED FRUIT; TRY BANANAS, APRICOTS, PEACHES, OR ANY FRUIT YOU HAVE DRIED
- 1 TBSP FRESH OR BOTTLED LEMON JUICE
- 2 TBSP HONEY (OPTIONAL)

This is a great after-school snack that is easy to make with your dried fruit. You could serve it on toast, crackers, celery sticks, or apple wedges.

Procedure: Mix all of the ingredients in a small bowl and stir until well blended. Serve on your choice of toast, crackers, celery, or apples.

Journaling

What dried fruits did you use for your spread?

What challenges did you have with this activity?

What would you do differently next time? Why?

5. Let's Make Granola

Granola is not only good to eat, it's good for you. Try blending your dried fruit with oats, coconut, nuts, and seeds. You can choose from a variety of fruits, nuts, and seeds. You can use a number of different ingredients to vary the flavor.

Check your recipe books for a granola recipe. Record the recipe in your recipe file. Check out the granola recipe on the So Easy to Preserve website at www.soeasytopreserve.com.

Journaling

What dried fruit did you use in your granola?

What challenges did you have with this activity?

What would you do differently next time? Why?

6. Let's Make Vegetable Soup

Dried vegetables usually need to be rehydrated before they are cooked. If placed directly into the boiling soup or stew, and not given time to plump, they will not be tender in your soup.

To rehydrate vegetables, soak them long enough to reabsorb most of their lost water. Use only as much water as necessary to cover the vegetables when rehydrating. You may use the water in your soup or stew when done. Rehydrating may take 15 minutes to 2 hours, depending on the vegetable, thickness of pieces, and temperature of the water. The hotter the water, the quicker dried vegetables will rehydrate. (Freshly dried vegetables will not take as long to reconstitute as those that have been stored for a long time.) Do not let vegetables stand at room temperature more than 2 hours without refrigeration. After they are rehydrated, vegetables are ready to be cooked.

Procedure: Bring water to a boil. Add dried vegetables, bouillon, and seasonings. Add meat and/or rice if you prefer. Simmer about 20 minutes or until vegetables are tender, but chewy. Enjoy your soup, and remember to refrigerate the leftovers.

Variation: Add 1 pound browned ground beef, or 1 cup cooked and cubed chicken (or you can use canned beef or chicken). You may also want to add ½ cup rice, noodles, lentils, or barley with the other ingredients.

RECIPE: VEGETABLE SOUP

INGREDIENTS:

- 4 CUPS WATER
- ¾ TO 1 CUP DRIED VEGETABLES (GREEN BEANS, CORN, PEAS, TOMATOES, OR A MIXTURE OF VEGETABLES)
- 2 PACKAGES BOUILLON GRANULES OR CUBES
- 1 CUP TOMATO PUREE, SAUCE, OR CRUSHED TOMATOES
- 1 TSP SALT
- ¼ TSP PEPPER
- SEASONINGS TO TASTE (HERBS SUCH AS THYME, PARSLEY, OR ANY HERBS THAT YOU HAVE DRIED IN THIS PROJECT; OR TRY SOY SAUCE OR CURRY POWDER)

YIELD: SERVES 6

Journaling

What dried vegetables did you use in your soup?

What challenges did you have with this activity?

What would you do differently next time? Why?

7. Let's Make a Vegetable Leather

You might want to try making vegetable leather. Cooked sweet potatoes work well, either alone or mixed with a fruit such as strawberries. You may also want to mix orange, lime, or pineapple juice with your cooked sweet potatoes. Use 1 cup cooked sweet potato, ¾ cup water, and ¼ cup fresh lime juice. Puree all the ingredients in a blender until smooth. Dry as you would fruit leather.

Journaling

What dried vegetable did you use for your leather?

What challenges did you have with this activity?

What would you do differently next time? Why?

8. Let's Dry Herbs

Select one method of drying herbs or dry one herb in two different ways. Follow the directions on page 24 of this manual.

Journaling

What herb did you dry?

_____
_____
_____
_____
_____

What challenges did you have with this activity?

_____
_____
_____
_____
_____
_____
_____

What would you do differently next time? Why?

_____
_____
_____
_____
_____
_____
_____

9. Conduct a Taste Test

Select a fruit or vegetable and dry it using different methods. Some suggestions:

- Dry canned peaches and fresh peaches.
- Dry bananas using no pretreatment and using a pretreatment such as an anti-darkening agent on different trays.
- Make fruit leather with cooked and uncooked fruit.
- Make a soup with dried vegetables and the same soup with fresh vegetables.
- Use a combination of fruits for your fruit leather.
- Make a fruit leather using baby food and another using canned fruit or home-processed fruit.
- Compare a commercially prepared item with a home-preserved item.

After drying your item or items, share them with a panel of at least four people. Here are some suggestions for your taste test:

- Do not tell the panelists how you dried your fruit or vegetable.
- Ask panel members to write down comments about each of the samples they are comparing.
- Ask panel members to indicate which sample they prefer. Then rank the samples from best to worst.
- Share the drying methods used with the panel.
- Record the results of your taste test.

Journaling

What types of dried foods did you compare in your taste test?

What challenges did you have with this activity?

What would you do differently next time? Why?

10. Label Your Product

Determine what type of dried food storage container you need to use for your dried food. Label the container. Here are some important items to include on your label:

- Type of food
- Date you dried your product
- Pretreatment (if used)
- Any other information you may want to know about the dried product

Journaling

What type of storage container did you choose to label?

What challenges did you have with this activity?

What would you do differently next time? Why?

11. Going Further: Create Your Own Activity

Using one of the resource materials listed in the front of this manual, create your own activity. Resource materials are available at your local Extension office.

Here are some suggestions to help you:

- Identify the resource you will be using; for example, *So Easy to Preserve* or *How to Dry Foods*.
- Decide the recipe or method you want to use.
- Get equipment, food, and packaging ready.
- Follow the information and directions carefully.
- Evaluate your results.

Journaling

What activity did you decide to do?

What challenges did you have with this activity?

What would you do differently next time? Why?

12. Make a Menu Plan

Using the menu planning information in the front of this manual, develop a menu plan for your friends or family. Include some foods that you have dried.

Menu:

Journaling

What menu or menus did you plan?

What challenges did you have with this activity?

What would you do differently next time? Why?

13. Read and Make Nutrition Labels

Check the labels of dried fruits in the grocery store. Compare the labels. Record the ingredients listed on the labels.

Journaling

List the ingredients in the dried foods.

What challenges did you have with this activity?

What would you do differently next time? Why?

Create a nutrition label for one of the dried products that you preserved in this project. Be sure to list the ingredients in descending order by weight.

Show what you have learned

The purpose of a presentation is for you to share some of the fun activities you completed or important information you learned about preserving foods by drying. You are required to give a demonstration or illustrated talk to complete this project.

Some ideas you might consider are:

- Explain the different drying methods.
- Display different drying storage containers and tell the pros and cons of each.
- Show how to label your dried food properly.
- Define what blanching is and tell why it is important.
- Show how to conduct a taste test.
- Share something from one of the recipes you made in this project.
- Explain what conditioning is and why it is important.
- Show how to prepare fruits or vegetables for drying.
- Show how to make fruit leather.
- Compare the costs of drying foods in a dehydrator vs. oven drying or sun drying.
- Compare pretreatment methods.

Reflections on drying

Do, Reflect, and Apply are how 4-H youth, "Learn by Doing." You have experienced several activities in this project; shared the results; and discussed them with your club members, leaders, and families. You have applied what you learned by showing others how to preserve food by drying. To show what you have learned, answer at least two of the following questions.

Q. Why is drying an effective and economical way to preserve food?

Q. Why do vegetables need to be blanched before drying?

Q. Why is it important to condition your fruit?

Q. Explain the different ways to pretreat your fruit prior to drying and why pretreatment is important.

Explain the different drying methods, which one you used in your project, and why you used it.

Explain the menu plan you developed using foods that you preserved in the drying project.