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UNIVERSITY OF MISSOURI

COLLEGE OF AGRICULTURE

AGRICULTURAL EXTENSION SERVICE

Columbia, Mo.

4-H Club Circular 88

January, 1948

4-H Youth Learn to Can and to Store Food (Preservation I)



Yes, Carolyn and Marilyn are sisters and twins, too. You may not be so fortunate in having a helper when you are ready to can tomatoes. However, you can assist Mother and do part of the canning alone. The jars of tomatoes Marilyn is taking from

the canner will help provide vitamin C for the family next winter when they do not have fresh fruits.

Since you are learning to preserve food you will can foods that are less difficult to can, such as tomatoes and fruits. You probably know that

*Prepared by Flora Carl and Josephine Flory, Extension Specialists in Food and Nutrition, in collaboration with Dorothy Bacon, State Club Agent.

fruits are important in our diet. They contain needed food elements that give us pep and make us feel and look well.

If we are to keep all these food

elements we must follow certain directions when preserving food. In this project you will learn to can by the best methods, and also how to store vegetables and fruits.

PRESERVATION OF FOOD BY CANNING

Canning is one method of preserving food so it can be used later. Heat is used to kill all the organisms which cause spoilage and the product is sealed in air-tight containers so no others can get in. By canning you can have various foods when they are not available fresh. Also, better meals for less money are possible the year around.

The health value of an improved diet cannot be measured in dollars and cents.

Canning Equipment for Tomatoes and Fruits

The right kind of canning equipment saves time and labor and insures a better product. By careful planning, families could obtain the right tools to work with and canning would be easier. Before the canning season begins, the canning equipment should be gotten ready for use and a list made of new equipment needed.

Canners.—The largest piece of equipment needed for canning fruits and tomatoes is the processing kettle. It is frequently called "the canner." There are two general types of canners or kettles used for canning tomatoes and fruits—the water bath and the steam cooker or steamer.

Any container may be used for a water bath if it has a flat bottom, a well-fitted lid, and sufficient depth to allow the jars to be covered with one

inch of water when placed on a rack in the bottom of the utensil. A large kettle, a wash boiler, a lard can or a good-sized bucket is frequently used for a water bath. Its size should be suitable to the number of jars one usually cans at a time.

A rack is needed to keep the jars from direct contact with the heat. The jars may break if no protection is afforded. The circulation of water or steam around the jars is better if they are one inch or more from the bottom of the processing kettle. Wire baskets or racks to fit the processing kettle may be purchased or made by a tinner at small cost. Or a false bottom may be made at home of strips of wood, folded hardware cloth, or wire netting.

Any home can have a water bath and it can be used to can fruit, tomatoes and other acid foods satisfactorily.

A water bath has several disadvantages: (1) It takes lots of water. (2) It takes much fuel to heat the water to boiling and to *keep it boiling* during the processing period. (3) For long processing periods, boiling water must be added to keep the jars covered with boiling water.

A *steam cooker* or steamer is a container at least an inch taller than the jars. It has a well-fitted lid, which allows only a little steam to escape, and a rack for the jars to

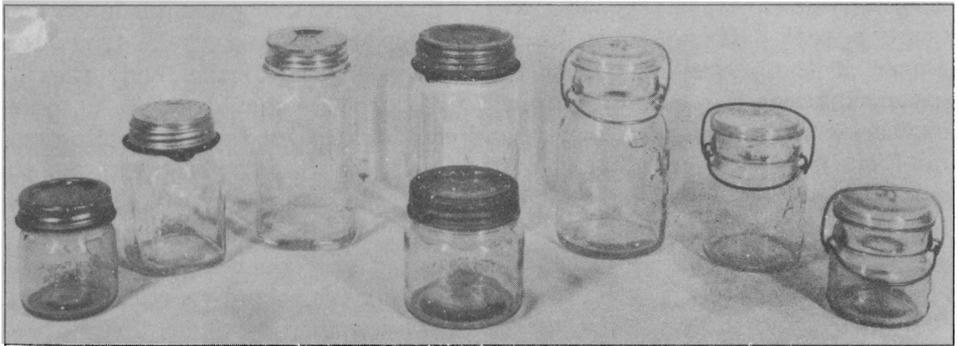


Fig. 2.—Various types of glass jars.

stand on. There are many types of steam cookers on the market. Pressure saucepans, large roasting pans, waterless cookers, and other large kettles with well-fitted lids are sometimes used as steam cookers for canning.

Pressure cookers and pressure saucepans may be used as steamers by fastening the lid and leaving the petcock open or the weight off during processing. The time for processing is one-fourth longer in the steamer than in the water bath. There is some air between the particles of steam, so the temperature is not as high as in the water bath.

Glass Jars.—More homemakers use glass than tin because they have glass jars, and there is not the added expense of buying a tin can sealer. Glass jars have eye appeal for the canner, who enjoys seeing and showing her work. Glass jars can be used over and over again, for as long as they are not damaged.

Any of several types of jars on the market are satisfactory if they can be sealed perfectly. A good jar is simply made, has a large opening and is easy to clean and seal. Jars should be well-tempered to stand

high heat and a change of temperature without breaking. A clear colorless glass is best for exhibit purposes. All parts of the jar, especially the top and the shoulder, should be smooth. Nicks or rough places are hard to clean, make good lodging places for spoilage organisms, and may prevent a perfect seal. Sometimes a slight roughness may be removed by using sandpaper.

Pint and quart jars are best for home canning, while $\frac{1}{2}$ pints or smaller containers are best for preserves, jams and similar products.

Lids.—There are four general types of lids for glass jars: the *self-sealing* or vacuum type, the *screw-top*, the *three-piece*, and the *spring glass-top* or lightning type.

The self-sealing tin lids or flats seal with cement at the top of the jar. The lids or flats are fastened with a metal ring which screws down. The metal lids or flats must be purchased new each year, but the rings may be used many times. These self-sealing lids cannot be tested because the seal is not made until the jar has cooled after being processed.

The screw-top lids may be used as

long as they are sanitary and will make a seal. They should be replaced if the porcelain in the top becomes loose, the metal corroded, or otherwise damaged. A screw-top lid from a jar of spoiled food may spoil a new pack even though it has been boiled in soda water.

The three-piece lid has a glass lid, a small rubber, and a metal screw band. They should be tested, as the screw top and lightning type lids, before they are used.

The wire clamp or bail is the important thing to examine in the spring-top or lightning type jars. The spring and clasp should close on the lid with a snap. If the wire clamp becomes loosened after use, it can be tightened by removing the top wire, bending it down in the middle, and then bending the sides inward so they will fit the jar. When using any type of lid follow the directions that come with them.

Tin Cans.—Tin cans sealed with a sealing machine may be used three times if properly reflanged.

Other Equipment.—Other desirable pieces of canning equipment include: clock, shallow pans, preserving kettles, colander, wire basket, jar funnel, measuring cup and spoons, quart measure, ladle or dipper, jar lifters, long handled spoons, wooden spoon for stirring, stainless steel paring knives, spatula, scissors, household scales, vegetable brush, strainer, and large pans for washing foods. A good jar lifter is light weight but sturdy, and grips the jar firmly without slipping. Its handles are long enough to protect your hands.

For heating the food use utensils

of aluminum, or good grade enamelware, or stainless steel. Iron utensils may discolor the food. Galvanized utensils should not be used for cooking any food or for holding acid foods which have been cut, as the food may take up zinc from the metal and become poisonous. Use copper or copper lined utensils for cooking fruits and vegetables only if the utensils are kept bright and shiny and the food removed immediately after cooking. Otherwise these utensils may cause the food to become unwholesome.

Lots of heat and water, adequate working surfaces at the right height, comfortable stools or chairs, and a screened, airy, light place to work will make your canning job easier.

Methods of Canning

The three general methods used in canning are the *open-kettle* or cooked-in-the-kettle method, the *cold pack* cooked-in-the-jar method, and the *hot pack* or heated and then cooked-in-the-jar method.

Processing is heating the jars or cans of food at a temperature high enough and long enough to make the food keep.

Open Kettle Method.—With this method, the food is cooked until done; then immediately packed in hot sterilized jars and sealed. The jars must be filled brim full and all air bubbles removed.

Jars must be boiled or steamed for 10 minutes to be sterilized. Rinsing the jars with hot water does not sterilize the jar.

The open kettle method is sometimes used for acid foods as tomatoes and peaches and frequently used

for pickles, preserves, jams and marmalades which have liberal amounts of vinegar or sugar. Even for most of these foods however, at least 5 minutes of processing is desirable.

Loss of food through spoilage is high with the open kettle method. For it is difficult to keep the container and food sterile when transferring the food from kettle to jar and usually some air is dragged in. Soft fruits canned by this method usually break and become mushy. Some fruits lose much of their delicate flavor. Often, vitamin loss is greater with the open kettle than with the cold pack or hot pack methods.

Cold Pack Method.—When the cold pack method is used, the product is packed into the jar raw, boiling liquid or sirup is added, the jar lid is adjusted and then processed in a water bath or steam cooker. When the food is placed in the container cold it takes longer for the food at the center of the jar to reach a high temperature. This is especially true when the product is a thick, pasty product such as cream-style corn or a dense fibrous product as greens. Tomatoes and fruits with a rather large portion of liquid heat through quickly. The texture, form, color and flavor of all except the hard fruits are usually superior if canned by the cold pack method.

Hot Pack Method.—When the hot pack method is used the food is partially cooked, then packed hot into the container, and processed the required length of time.

More food can be packed into a jar by the hot pack method than the cold pack method. It may be the best method for canning all products

if the number of jars and jar space is limited. With the hot pack method, the food is wilted and shrunk and the air driven out. By having the food boiling hot at the beginning of the processing period, the food at the center of the can is processed as long, and at more nearly the same temperature, as the food near the side of the jar. This method is best for all vegetables except tomatoes.

Steps in Canning

To have a high quality canned product that will keep, give careful attention to the following steps, as well as to the directions for canning different foods.

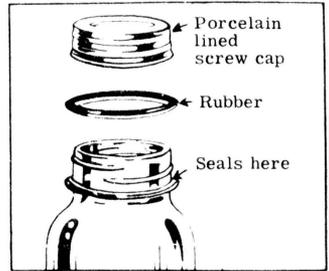
1. Prepare Equipment.—Assemble all equipment needed for canning the product and make sure it is ready for use. Examine the jars and lids carefully. Discard all that are imperfect. Wash jars in soapy water, rinse and place them in a pan of hot water—so they will be clean and hot when needed. Make sure all pans, towels, etc., are clean. Cleanliness is a most important factor in successful canning.

If screw-top, three-piece, or spring-clamp jars are used, test the rubbers and jars. Discard used rubbers which show the imprint of the lid. Good rubbers show no pinholes or cracks when pinched.

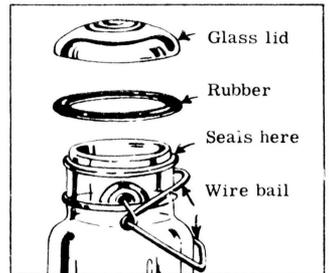
To test the screw-top, three-piece, or spring-clamp glass-top jars, pour about a cup of hot water in the jar, adjust the rubber and lid, and invert. If there is any leakage, press down on the edge of the screw-top lid, tighten the clamp of the glass-top jar or try other lids until there is no leakage. Keep the proper lids and

JAR LIDS AND HOW TO USE THEM

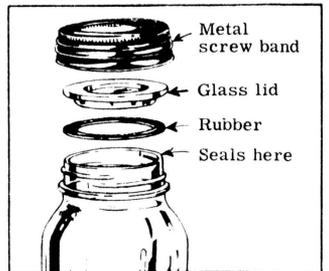
Before filling the jar, fit a wet rubber ring down on the jar shoulder. Do not stretch more than needed. Fill jar. Partially seal by screwing lid down firmly tight and turning it back $\frac{1}{4}$ inch. At the end of the processing period remove the jar from the water bath or pressure cooker and immediately screw the lid down tight to complete the seal.



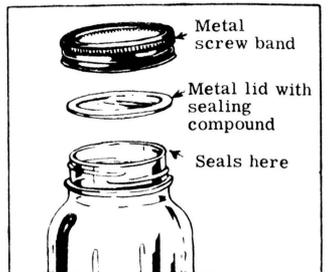
Before filling the jar, fit the wet rubber ring on the jar. Fill jar. Put on glass lid. Partially seal by pushing the long wire bail over top of lid, so it fits into groove. Leave short wire bail up. At the end of the processing period remove jar from the water bath or pressure cooker and immediately push short wire bail down to complete the seal.



Before filling the jar, fit the wet rubbering on the glass lid. Fill jar. Put lid on with rubber side down. Partially seal by screwing the deep metal band on firmly tight; then turn back a quarter of a turn but make sure it really catches. At the end of the processing period remove jar from the water bath or pressure cooker and immediately screw band down tight. When the jar is cold remove the screw band.



Fill the jar. Dip metal lid in boiling water, place on top of the jar with sealing compound next to the glass. Screw shallow metal band on firmly tight but not hard enough to cut through the compound. At the end of the processing period remove the jar from the pressure cooker or water bath. Do not tighten further unless the band is very loose, then hold the lid firmly while the band is tightened. When the jar is cold remove the screw band.



jars together. Have the processing kettle on and the water near boiling.

If a sugar sirup is needed make it in advance so it will be ready when needed.

2. Select High Quality Products.

—Select fresh, sound products at their best eating stage. Grade for like size and the same degree of ripeness for a uniform product. Foods that have grown slowly are over-mature. Foods gathered for some time are more difficult to can than fresh food in prime condition.

TWO HOURS FROM THE GARDEN TO THE CAN IS A GOOD RULE TO FOLLOW IN CANNING FRUIT, TOMATOES AND OTHER VEGETABLES.

3. Wash Products.—Wash the fruits or vegetables thoroughly. The most dangerous bacteria and the most difficult ones to kill are in the soil. Always lift the fruits and vegetables out of the water, rather than pouring the water off. Wash fruits that have caps or stems, such as strawberries, cherries, and grapes, before stemming so there will be less loss of juice and so water will not go into the fruit and hasten fermentation.

4. Prepare Product for Processing.—Prepare the product as for cooking and follow the directions given for each product.

5. Pack the Food in the Container.

When using glass jars, remove one jar at a time from the hot water. Keeping the jars hot helps prevent breakage and lessens the number of spoilage bacteria present during packing and processing. Pack the container quickly so the precooked food remains hot. Use enough liquid

to prevent too dense a pack (about $\frac{1}{3}$ liquid to $\frac{2}{3}$ solid). Work out air bubbles with knife blade or spatula. Leave $\frac{1}{2}$ inch of head space in glass jars for tomatoes and fruits. Tin cans should have from $\frac{1}{4}$ to $\frac{1}{2}$ inch head space. The solid material in the jar should be covered with liquid, sirup, or juice to preserve color, texture and flavor.

6. Adjust Lids of Jars.—As each glass jar is packed, carefully wipe top of jar and rubber ring to remove any particle of food, then adjust lid. (See page 6, "Jar Lids and How to Use Them"). Seal tin cans as rapidly as possible after filling. If too much air is left in the can when sealed, the food may discolor and lose some flavor, and the processed tin can will cave in.

7. Process the Food.—Place containers on the rack of canner which contains boiling or near-boiling water. Do not crowd the jars, as this may cause them to break as they expand when heated. Crowding the containers will also interfere with proper circulation of water or steam. In a water bath the water should be at least one inch deeper than the height of the tallest jar so that the top of the jar will be processed at the same temperature as the rest of the jar.

Cover the water bath with a well fitted lid and keep the water in a rolling boil for the required processing time. Use enough water in the steam cooker or pressure saucepan to keep it from becoming dry during the processing period. Keep the steam "up" throughout the processing time. As memories are poor, it is wise to write down when to remove the jars

or cans. Make sure the food is processed the time given for each product. If the water in the canner stops boiling or more water is added, deduct the time needed to bring it back to boiling.

8. Remove from Canner, and if Necessary, Readjust Lids.—Remove the lid from the water bath or steam cooker and immediately remove all jars or cans.

Push down the clamp on spring top jars. Screw tops of the three-piece and screw-top jars immediately as tightly as possible.

Turn all jars, except those with self-sealing lids, from side to side to make sure there is no seeping of air, or leakage. Do not attempt to tighten the top of jars with self-sealing lids. When processed jars start to cool, steam condenses within the jars forming a partial vacuum. Greater pressure outside than inside the jar presses the top down firmly forming the seal. Cool all jars in an upright position. Wipe containers to make them clean and shiny.

9. Cool the Containers.—Cool canned products as quickly as possible but be especially careful not to break the jars. Do not set the hot jars on cold metal surfaces. Cool the jars out of a draft but allow air space around jars or can for more rapid cooling.

Cool tin cans by putting them in cold, preferably running water.

When the jars are cold gently tap the metal lids of the self-sealing type jar with a spoon to see if they are properly sealed. If properly sealed, and no food is touching the lid, they will give a clear ringing note. If not

properly sealed the sound will be dull in a low key.

Invert other jars to make sure there is no leakage. If there is any leakage the food should be used. Or the jars may be processed one-half the regular time.

Do not try to tighten the lid after the jar is cooled, as this would break the seal. Remove bands from self-sealing jars when cold and save them to use again. If left on they may rust, be hard to remove, and the bands ruined.

10. Store.—Label all jars and cans giving name of product and date. Also label jars to determine a preferred variety and method of canning. Store in a clean, cool, dry, frost-proof place. Sturdy shelves with jars only two deep are desirable. Examine jars from time to time to make sure they are keeping. If there is any spoilage, carefully examine all containers from that lot.

Canning Tomatoes

Tomatoes are easy to can if you follow the proper directions, and do not try to can too many at one time. Spoilage bacteria grow rather rapidly after tomatoes are picked. For the best product, can them soon after picking. If tomatoes are allowed to stand long in a warm room after preparation for canning has begun, flat sour spoilage may occur.

For canning, select firm vine-ripened tomatoes of medium size and uniform shape, free from spots and decay. Well ripened tomatoes have a superior color and flavor.

If you must can tomatoes that are green around the stem or have sun-

burned, or other spots, cut away all the green or other off-colored portions which will give a poor flavor and color. Do not try to can tomatoes with soft or spoiled parts. Tomatoes are so juicy it is difficult to prevent spoilage organisms from getting on the good parts.

A bushel of good tomatoes will yield 15 to 20 quarts.

After washing the tomatoes place them in a wire basket or thin cloth and dip them in boiling water for $\frac{1}{2}$ to 3 minutes, depending on the degree of ripeness. If the tomatoes are well ripened the skin will slip off easily in less than a minute. If the tomatoes are kept in boiling water too long, the pulp will soften and cling to the skin when removed. After the hot water, plunge them quickly into cold water until cool enough to handle. Remove every bit of the cone shaped core from each tomato with a slender pointed knife and slip off the skins. Use either cold or hot pack method for canning tomatoes.

For *cold pack*, pack the tomatoes as closely as possible into the jars or cans. Tomato juice may be added or

tomatoes may be pushed down so firmly that sufficient juice is formed to fill the spaces and cover the solid portions. Add a teaspoon of salt per quart. Adjust seal and process quart glass jars in a water bath 25 to 45 minutes. If canned tomatoes often spoil in your community, process them 45 minutes; otherwise 25 minutes is sufficient.

For *hot pack* place the prepared tomatoes in a kettle with well-fitted lid and heat until all tomatoes are hot through. It takes longer to heat whole than cut tomatoes. Pack into jars, add a teaspoon of salt to each quart. Adjust seal and process 10 minutes in a water bath.

More tomatoes can be packed into a jar if the hot pack method is used.

Canning Fruit

The usual yield from $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds of raw fruit is one quart or a No. 3 can of fruit. For best results can fruit and other acid foods at a temperature not higher than 212° F. A water bath or steam cooker is best for this purpose. A quart of canned fruit will average 6 servings.

APPROXIMATE YIELD OF CANNED FRUITS FROM RAW FRUITS

Fruit	Quantity Raw	Yields
Apples (2-6 per lb)	50 lbs. or 1 bushel	16-20 quarts
Black or red raspberries	1 crate, 6 gal.-36 lbs.	14-16 quarts
Cherries (with seeds)	1 bushel or 56 lbs.	22-32 quarts
Gooseberries	1 gallon	3-4 quarts
Grapes	48 lbs. or 1 bushel	16-20 quarts
Peaches (5-8 per lb.)	50 lbs. or 1 bushel	18-22 quarts
Pears (3-4 per lb.)	58 lbs. or 1 bushel	20-25 quarts
Plums (15-20 per lb.)	56 lbs. or 1 bushel	25-30 quarts
Rhubarb	2 lbs.	1 quart
Strawberries	1 crate or 6 gallons	12-16 quarts
Tomatoes	50 lbs. or 1 bushel	15-20 quarts

Sirups for Canning Fruit

Fruits may be canned with a thin, medium, or thick sirup. The sirup selected will depend upon the use to which the canned fruit will be put. Other factors are the sourness of the fruit, the closeness of the pack and the tastes of the family. If the sirup is too heavy it will cover the fruit flavor and tend to shrivel the fruit, causing it to rise in the jar. If the sirup is too light the juice and the fruit will lack proper body and flavor. The sirup should be poured over the fruit boiling hot. Use enough sirup to cover the fruit and fill the jar to within $\frac{1}{2}$ inch of the top. The amount of sirup needed will vary with the size and kind of fruit and the firmness of the pack. Ordinarily, however, each quart jar will require from $\frac{1}{2}$ to 1 cup of sirup. Three cups of water and the sugar will ordinarily yield enough sirup for 4 or 5 quarts. To make sirups of thin, medium, and heavy density, vary the proportions of sugar and water as follows:

Thin sirup

1 cup sugar 3 cups water
Mix and heat to boiling point.

Medium sirup

1 cup sugar 2 cups water
Mix and heat to boiling point.

Heavy sirup

1 cup sugar 1 cup water
Mix and heat to boiling point.

Fruit juice may be used in place of water in making the sirup. A heavy sirup may be diluted to form a medium or thin sirup.

Canning Fruit Without Sugar.—Fruit can be canned without sugar

but if sugar is needed when the canned fruit is used, add at least a part of it when canning. Sugar helps fruit retain its natural color, flavor and form. Process fruit canned without sugar as long as fruit with sugar. If fruit is plentiful, ripe fruit may be used to make juice. Add sugar to this juice and use it instead of a sugar-water sirup for canning fruit. Sirup made from fruit juice is usually sweeter than sirup made with water.

Honey may replace up to one-half the sugar used in canning, and corn sirup up to one-third.

Canning Fruit and Tomatoes

For all fruits follow the general directions for canning given under "STEPS IN CANNING" on page 5.

Apples

Hot Packed.—Choose a variety of apples that will hold their shape when heated. Sound, slightly under-ripe, tart apples are preferable. Wash, pare if desired, leave whole or cut in halves, quarters or circles, and core. To prevent darkening, drop immediately into a hot thin sirup or dip into cold water containing 1 tablespoon of salt and 1 tablespoon of vinegar for $\frac{1}{2}$ gallon of water. Add boiling thin or medium sirup. Boil from 3 to 5 minutes depending on the size of the pieces. Pack into clean hot jars to $\frac{1}{2}$ inch of the top. Cover with boiling liquid. Remove air bubbles. Adjust the lids and process quart jars 15 minutes in a boiling water bath.

Cinnamon Apples.—Proceed as for hot packed apples but flavor the thin or medium sirup with red hots or with cinnamon and enough pure

red vegetable coloring to give the desired color and flavor. Remember, the color will become more pronounced after standing several hours.

Baked Apples.—Choose sound slightly under-ripe apples suitable for baking. Wash, core and bake as for table use until about half done. Pack into clean, hot jars. Cover with a thin or medium sirup. Remove air bubbles. Adjust the lids and process quart jars 15 minutes in a boiling water bath.

Apple Sauce—Choose slightly under-ripe, tart, summer apples or other apples that will make good apple sauce. Wash, remove any blemishes including the stem and blossom area. Do not peel or core but cut into thin pieces that will cook up quickly. Place in a flat bottomed rather shallow pan with well fitted lid. Add boiling water just until it can be seen. Heat quickly. Boil until the apples can be pushed through a food mill or strainer to remove skin and core. Add from one to two tablespoons of sugar for each cup of apple pulp. Heat quickly to boiling, pour into clean hot jars filling to $\frac{1}{2}$ inch of the top. Remove air bubbles. Adjust lid. Process quart jars 10 minutes in a boiling water bath.

Apricots

Cold Pack—Choose ripe fruit. If the apricots are too green there is an astringent taste that neither cooking nor sugar will wholly overcome. Wash, peel if desired. Leave whole or cut in halves and remove pit. Pack firmly tight, cups downward, into clean jars to $\frac{1}{2}$ inch of the top. Cover with boiling, thin or medium,

sirup. Remove air bubbles. Adjust lid. Process quart jars for 20 minutes in a boiling water bath.

Hot Pack—Wash. Peel if desired. Leave whole or cut in halves and remove pits. Drop into boiling, thin or medium sirup. Heat just until fruit is boiling hot. Pack into clean jars to $\frac{1}{2}$ inch of the top. Cover with the boiling sirup. Remove air bubbles. Adjust the lid. Process quart jars 15 minutes in a boiling water bath.

Blackberries, Dewberries, Raspberries, Huckleberries

Gather berries in shallow buckets, pans or baskets to prevent bruising and crushing. Can as soon as possible. Use the smaller, softer, less perfect berries to make juice or puree.

Cold Pack—Select ripe firm berries. Wash. Drain and pack into clean jars to $\frac{1}{2}$ inch of the top. Cover with boiling hot medium sirup (juice from very ripe berries may well be used for making sirup). Remove air bubbles. Adjust the lid. Process quart jars 20 minutes in a boiling water bath.

Hot Pack—Wash, drain. Pour into flat bottomed shallow pan with well fitted lid. Add from $\frac{1}{4}$ to $\frac{1}{2}$ cup of sugar to each quart of berries. Cover and bring to a boil, shaking pan to prevent sticking. Pour into clean hot jars, filling to $\frac{1}{2}$ inch of the top. Remove air bubbles. Adjust the lid. Process quart jars 15 minutes in a boiling water bath.

Cherries

Cold Pack (not pitted)—Select ripe perfect cherries. Wash, stem, drain, prick and pack firmly tight into clean jars to $\frac{1}{2}$ inch of the top.

Cover with a boiling medium or heavy sirup. Remove air bubbles. Adjust the lid. Process quart jars 20 minutes in a boiling water bath.

Hot Pack (pitted)—Wash cherries. Remove stones being careful to save juice and can the pitted cherries immediately as they lose flavor rapidly and darken. Pour juice and cherries in a flat bottomed pan with a well fitted lid. Add $\frac{1}{2}$ cup sugar for each quart of cherries. Heat until all the fruit is boiling hot. Pack in hot jars to $\frac{1}{2}$ inch of the top. Remove air bubbles. Adjust lid and process quart jars 10 minutes in a boiling water bath.

Gooseberries

Cold Pack—Wash. Stem. Pack firmly tight into clean jars to $\frac{1}{2}$ inch of the top. Cover with a medium or a heavy sirup. Remove air bubbles. Adjust the lid. Process quart jars 20 minutes in a boiling water bath.

Hot Pack—Wash. Stem. Put into hot medium or heavy sirup. Heat to boiling. Pour into clean hot jars filling to $\frac{1}{2}$ inch of the top. Remove air bubbles. Adjust the lid. Process quart jars 10 minutes in a boiling water bath.

Peaches

Cold Pack—Select fully ripe peaches. Wash. Place in a wire basket or cheese cloth and dip for a minute or two in boiling water then quickly into cold water. Slip off skins. Leave whole or cut in halves or slice, taking out the pits. To keep from darkening, dip into water containing 1 tablespoon of salt and 1 tablespoon of vinegar for $\frac{1}{2}$ gallon of water. Pack firmly into

clean jars to $\frac{1}{2}$ inch of the top. Cover with a thin or medium sirup in which several cracked pits were boiled. Remove air bubbles. Adjust lid. Process quart jars 25 minutes in boiling water bath.

Hot Pack—Wash. Slip off skins. Leave whole, slice or cut in halves. Drop in a medium sirup and boil from 4 to 8 minutes depending on the firmness of the fruit. Pack into clean hot jars filling to $\frac{1}{2}$ inch of the top. Cover with the boiling liquid. Remove air bubbles. Adjust the lid. Process 15 minutes in a boiling water bath.

Baked Peaches—Bake small seedling peaches in the oven, whole with skins on, until about half done. Pack into jars. Cover with a light to medium sirup and process 15 minutes in a boiling water bath.

Pears

Pick the pears when fully grown but underripe and let them ripen before canning. Kiefer pears need to be held in storage about 2 weeks at a temperature of near 65° F. Bartlett pears ripen more quickly in storage.

Pears may be canned whole, in halves, or sliced and peeled, or without peeling. To prevent darkening, add lemon juice or citric acid, or place them in cold water containing 1 tablespoon of salt and 1 tablespoon of vinegar to $\frac{1}{2}$ gallon of water. If pears are canned whole leave the stem but remove the blossom end. If cut in halves remove the stem and core. Drop the pears in a hot, thin or medium sirup. Boil from 2 to 8 minutes depending on the firmness of the fruit. Pack into clean

hot jars. Pack halves with cups downward.

Pack whole pears with the bottom layer stems up and the other layers alternately stems down and up. Cover with the boiling liquid. Add a small stick of cinnamon if desired. Remove air bubbles. Adjust the lid. Process quart jars 20 minutes in a boiling water bath.

Because of their mild flavor, pears may well be used with other flavors when various fruits are scarce.

Plum Pears—Use tart red plum juice instead of water for making the sirup.

Orange Pears—Add the juice and rind of 1 orange to each quart of sirup. Rind might be removed before packing the pears.

Cinnamon Pears—Add from 2 to 3 tablespoons of red hots to each quart of sirup or use stick cinnamon and a few drops of red food coloring.

Mint Pears—Add a few drops of mint flavoring and of green cake coloring or vegetable coloring to the sirup.

Ginger Pears—Cook ginger root in water and use this water for making sirup or add candied ginger to the sirup.

Pineapple Pears—Use pineapple juice in place of water in making sirup.

Pineapple

Select fully ripe pineapple as the underripe lacks flavor. Wash. Twist out the top and cut off the base. Peel, cutting to about half the depth of the eyes. Slice and remove the rest of the eyes and core. Leave the slices whole or cut in finger pieces, chunks, or other desirable pieces.

Pack into clean jars to $\frac{1}{2}$ inch of the top. Cover with a boiling thin or medium sirup. Remove air bubbles. Adjust lid and process quart jars 30 minutes in boiling water bath.

Plums

Pick the plums just as they are beginning to become soft and ripe. If too ripe they go to pieces, if too green they lack flavor and are sour. They are usually canned whole with the skins. The skin may be removed by plunging in boiling water for one minute and then in cold water. If the skin is removed immediately the plums will be green or yellowish depending on the variety, but if they are allowed to stand a few minutes before peeling, they become reddish from contact with the skin. If let stand too long they become brown. If the skin is not removed it should be pricked with a fork to prevent splitting of the skin. They may be cut in halves, the pits removed and the halves packed cups downward.

Cold Pack—Pack plums in clean jars to $\frac{1}{2}$ inch of the top. Cover with boiling thin to medium sirup. Remove air bubbles. Adjust lid. Process quart jars 20 minutes in boiling water bath.

Hot Pack—Heat to boiling in juice with $\frac{1}{4}$ to $\frac{1}{2}$ cup of sugar for 1 quart or in thin to medium sirup. Pack in clean hot jars to $\frac{1}{2}$ inch of the top. Cover with boiling liquid. Remove air bubbles. Adjust lid. Process 15 minutes in boiling water bath.

Rhubarb

Select young tender stalks. Wash. Cut off the tip and root ends but do

not skin. Cut in $\frac{1}{2}$ - to 1-inch pieces. Add $\frac{1}{2}$ cup of sugar to each full quart of rhubarb. Cover and heat in the oven until boiling hot, or let stand in sugar to draw out juice then bring to a boil. Pack into a clean hot jar to $\frac{1}{2}$ inch of the top. Remove air bubbles. Adjust the lid. Process quart jars 10 minutes in a boiling water bath.

Strawberries

Select fresh, fully ripe, juicy berries that have been gathered in shallow containers. Wash thoroughly. Drain. Stem. Add $\frac{1}{2}$ cup sugar to a quart of berries. Heat slowly to boiling point. Remove from fire. Let berries stand in the sirup from 2 hours to overnight. Bring quickly to a boil. Pack in clean hot jars to $\frac{1}{2}$ inch of the top. Adjust lids and process quart jars 10 minutes in boiling water bath.

Tomatoes

Select fresh smooth, firm, vine-ripened tomatoes. Do not use tomatoes that have decayed portions. Wash the tomatoes and plunge them into boiling water for 30 to 45 seconds or until the skin slips. Remove all the core and any green portion and slip off all the skin. Make sure the small black spot at the blossom end is removed. Make sure there is no delay after the tomatoes are heated as flat sour may develop in an hour or so.

Cold Pack—Pack the prepared tomatoes into clean jars to $\frac{1}{4}$ inch of the top. Press them down just hard enough to form juice to fill the spaces and cover the solid portions. Add 1 teaspoon salt to each quart before

the last tomato is put in. Remove air bubbles. Adjust the lid. Process quart jars 25 minutes in a boiling water bath.

To keep the tomatoes whole, do not press them in to make their own juice but fill in the space with tomato juice. Tomatoes canned this way are especially nice for salads.

Hot Pack—Leave the tomatoes whole or cut in quarters and heat until all parts are boiling hot. Pack in clean hot jars to $\frac{1}{2}$ inch of the top of jar adding 1 teaspoon salt to each quart. Remove air bubbles. Adjust lids. Process quart jars 10 minutes in boiling water bath.

Why Fruit Floats in the Jar.—Heating food drives out the air causing it to wilt or shrink. When fruit is cooked in a sirup that is heavier than its own juice, the juice in the fruit passes out into the sirup by a process called osmosis. This causes the fruit to shrink, become lighter and float to the top of the jar. The heavier the sirup the greater the loss of juice from the fruit.

Heating fruit with a delicate structure as strawberries, breaks down the cell walls, the juice escapes and the fruit shrinks and floats. Fruits with a firmer structure, if over-processed, lose juice, shrink and float, leaving a clear sirup at the bottom of the jar. The more over-cooked the product, the higher the clear juice extends.

Discolored Fruit.—Fruit at the top of the jar often turns dark on standing. This may be due to spoilage or to enzyme activity which indicates under-processing. Peaches, pears and plums are frequently so affected.

Loss of Color in fruit is not un-

usual. Light causes all canned berries to fade. Berries lose color in the sirup and so are lighter. Berries and other red foods bleach in plain tin cans because of the action of the metal.

SCORE CARD FOR CANNED FRUITS AND VEGETABLES*

Package	10
Perfectly sealed standard containers of specified size. They should be clean, free of rust, and labeled. If tin cans are used, they should be bright, well labeled, and the ends slightly sunken.	
Pack	20
All space except proper headspace should be filled. 10	
Proportion of fruit or vegetable to liquid about 3 to 1. 10	
The liquid should just cover the product with no excess.	
Product	50
Absence of defects, foreign material, indications of spoilage. 10	
Right degree of maturity. No over or under-ripe or too mature or immature flavor.	
Uniformity	20
Pieces of fruit or vegetable should be reasonably uniform in size and degree of maturity.	
Color—As nearly that of the original as possible after cooking. Free from foreign matter.	
Consistency—tender without overcooking. Not mushy or broken.	
Flavor—Characteristic of the fruit or vegetable. 20	
Not covered up with sugar, not insipid and lacking in flavor.	
Liquid	20
Clear and bright rather than dull. Little or no cloudiness, few or no small particles. Free from gas bubbles. Sirups for fruits have suitable proportions of sugar.	
Total	
100	

*Adapted from material sent out by the Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture.

Explanation of the Score Card

Jar, lid, and can should be clean and free from any discoloration. The label should be pasted on straight about one inch from the bottom of the jar, if the jar is to be stored.

Liquid over the vegetable should not be clouded by starch from too mature vegetables or over-cooking or from particles of the vegetable broken off in processing. A bluish film on the bottom of the jar sometimes indicates flat sour. The liquid or juice of fruit should be clear and have a pleasant characteristic fruit flavor. A juice of medium or thin

consistency, sweet enough to cover some of the acidity but not the characteristic flavor of the fruit, is desirable.

The fruit or vegetable should have a firm texture and retain as nearly as possible the shape and color of the perfect fresh product. Tomatoes or red fruits should not be pale or faded. Overcooked fruits and vegetables look soft and mushy. Perfect fruit with no blemish is preferable. As nearly as possible, all the fruit in a jar should be uniform in size and color. The fruit should be tender, of good quality, thoroughly ripe, but not over-ripe.

The best flavor of canned fruits and vegetables is pleasant, and distinctive of that particular fruit or vegetable. It should not taste noticeably sweet or salty, since the sugar and salt should emphasize, not cover, the natural flavor.

The following words may be used in judging or comparing canned products: finer texture, coarse texture, natural color, good color, faded, off color, off flavor, overcooked, under-

cooked, firm, soft, mushy, underripe, overripe, free from spots, blemishes, mechanical or insect injury, free from mold, liquid of excellent consistency, clear, bright, not clouded, cloudy, too thick, too thin, jar not full enough, good taste and flavor, flat taste, white sediment, free from sediment, characteristic fruit flavor, young, tender, uniform in size, shape, color, full pack, too lose a pack, pieces have ragged edges.

PRESERVES AND MARMALADE

Preserves are small fruits or pieces of larger fruits cooked in a sirup until clear and stored in the sirup or jellied juice. These are wholesome sweets that can be made from any fruit but much nicer preserves are made from fruits that contain a high percentage of acid and pectin. Firm, ripe fruit is best as ripeness is needed for flavor, and firmness for good texture.

In preparing preserves, use uniform pieces of fruit, do not overcook, and do not add so much sugar that the fruit flavor is lost. Strawberries, peaches, plums, pears, cherries, quinces, watermelon rind, tomatoes, and pineapples are fruits commonly preserved. Some varieties of berries and peaches yield much better preserves than others.

Making Preserves.—Make only a small amount of preserves at a time using not more than 6 to 8 pounds of fruit. Prepare fruit as for cooking, keeping small fruit whole and cutting large fruit in uniform, fairly good-sized pieces. It is preferable to weigh rather than measure the fruit and use three-fourths as much sugar as fruit, by weight. The amount of

sugar will vary, however, with the sourness of the fruit and its pectin content. All fruit must be heated either in sirup or in water to change the cell walls so they will absorb sugar. Cooking in sirup tends to toughen the cell walls. Soft, easily crushed fruit as berries will need little or no water from the start. The heavy sirup will help the fruit hold its shape.

If fruit is hard, as quinces, pineapples, and some varieties of pears, add enough water at the start to form a thin sirup and the fruit will become tender before the sirup becomes heavy by evaporation. Starting hard fruits in a heavy sirup will cause them to become tough.

Juicy, tender fruits should stand several hours in sugar so they will become more firm and not go to pieces when cooked. The juicy fruits with firm skins, as cherries, may be ground, or started in a heavy sirup; the sirup is thinned rapidly as the juice comes from the fruit during the heating.

Use shallow pans and much heat. The shorter the cooking time the brighter the color and the richer and

more delicate the flavor of the preserves. Too much cooking will result in dark color and strong flavor.

Boil the fruit and sugar mixture until the fruit becomes clear and the sirup no longer runs off the spoon but goes off in a wide drop or sheet. Lemon juice may be added during the last few minutes of cooking to fruits that lack tartness. The lemon improves the flavor and causes the sirup to jell.

Fill sterilized jar three-fourths full of fruit and fill with the juice, seal, label and store.

Pear and Peach Preserves

The Kieffer pear is a variety commonly used for preserving because it holds its shape and has a good flavor. For best results allow the fruit to reach the firm-ripe stage. If possible, store Kieffer pears for 2 or 3 weeks at 60° to 65° F. to obtain the best qualities for preserving and canning.

Any variety of white or yellow peach of good dessert quality will make satisfactory preserves if chosen at the firm-ripe stage.

Wash and pare the pears or peaches. Cut into uniform pieces such as halves, quarters or eighths. To each pound of prepared fruit allow $\frac{3}{4}$ to 1 pound of sugar. Combine the fruit and sugar in alternate layers and let stand 8 to 10 hours or overnight before cooking. Or, add the sugar and $\frac{1}{4}$ cup of water for each pound of fruit and cook at once. In either case stir carefully while heating to boiling. Boil rapidly until the fruit is tender and clear and the sirup is somewhat thick. Stir to prevent burning, but be careful not to break the pieces of

fruit. Pour at once into hot sterilized jars and seal.

Damson Plum Preserves with Stones

Wash the plums, drain, and prick each plum in three or four places. For each pound of fruit use $\frac{1}{2}$ cup water and $\frac{3}{4}$ to 1 pound of sugar. Dissolve sugar in the water and bring to boiling. Add the plums and boil gently until the fruit is clear and tender and the sirup sheets from the spoon. Pour into hot sterilized jars and seal.

Strawberry Preserves

The color and flavor of strawberries are easily destroyed by heat. Hence, in making preserves it is well to cook them only a short time.

Method 1.—Select large firm tart berries. Wash, drain, and remove caps. For each pound of fruit use 1 pound of sugar. Combine the fruit and the sugar in alternate layers and let stand 8 to 10 hours or overnight. Heat to boiling. Boil rapidly for 15 to 20 minutes or until the sirup is somewhat thick. Stir carefully to prevent burning. Remove the scum. Pour at once into sterilized jars and seal.

Method 2.—Pick out the smaller, less perfect berries. Crush and cook for about 3 minutes, stirring constantly. Strain. To each pound of choice berries allow $\frac{1}{4}$ cup of this juice and 1 pound of sugar. Add sugar to the juice, stir, and heat slowly until the sugar is entirely dissolved. Drop berries into the sirup, simmer for 3 to 5 minutes, then boil rapidly for 10 to 15 minutes, or until the fruit is somewhat clear. Remove the scum. Allow the preserves to stand about 8 hours or overnight in

a glass or porcelain bowl. Pour off the sirup, fill hot sterilized jars three-fourths full with the cold berries. Then boil the sirup rapidly until fairly thick, or to 221° F. Pour the hot sirup over the berries and seal.

Tomato Preserves

Select firm, small yellow or red pear-shaped tomatoes. Wash and drain. If tomato preserves without skins is desired, dip the tomatoes into boiling water, then into cold water, and remove the skins before starting the preserving process. To keep skinned tomatoes whole, handle with extra care.

To each pound of tomatoes allow $\frac{3}{4}$ cup of water, $\frac{3}{4}$ pound of sugar, $\frac{1}{4}$ lemon thinly sliced, and one piece of ginger-root. Boil the lemon for 5 minutes in part of the water. Make a sirup with the remainder of the water and sugar. Add tomatoes, ginger-root, lemon, and the liquid in which the lemon was cooked. Boil until tomatoes are clear and the

sirup somewhat thick. Remove the scum; then pour the preserves at once into hot sterilized jars, and seal.

Marmalade

Marmalade is a bright sparkling product in which whole small fruits or pieces, slices, or shreds of fruit are suspended in a transparent jellied mass. It is really jelly in which pieces of fruit are suspended. All fruits that can be used for jelly will make good marmalades.

Of the fruit used one-fourth should be underripe. Use from $\frac{2}{3}$ to equal parts, by weight, of sugar as fruit pulp. Certain fruits are especially desirable for marmalades because of their tart flavor and high pectin content both of which are important in making juice jell.

Grape Marmalade.—Wash grapes and remove the stems. Press pulp from the skins. Cook the pulp and press through a sieve to remove seeds. Add the skins to the pulp. Measure the mixture and add two-thirds as much sugar as pulp. Cook

SCORE CARD FOR PRESERVES AND MARMALADES

Package	10
Sealed jars of standard size. Clean, well labeled.	
Product	50
Color—characteristic of the fruit, bright, clear, free from discoloration due to over-cooking.	
Consistency.—	
PRESERVES consist of tender whole small fruits or uniform pieces of larger fruits in syrup or jellied juice, depending on the kind of fruit.	
MARMALADES have the characteristics of both jellies and preserves. They contain the pulp and may also contain the skin suspended throughout the jellied juice. In citrus marmalades both jellied juice and slices or shreds of fruit appear. The product should be clear.	
Flavor	40
Characteristic of the fruit, free from excessive sweetness or overcooked flavor.	
Total.....	100

the mixture until the skins are tender, or about 20 minutes. Place in clean, hot sterilized jars, and seal.

Amber Marmalade.—Select an orange, a grapefruit, and a lemon—each smooth, thick-skinned, and free from blemishes. Remove the peels, slice peels very thin, add a quart of cold water, and parboil for 5 minutes. Drain off the water, add a quart of fresh water, parboil again and drain. Add water a third time, parboil and drain.

Cut the fruit pulp into thin slices and remove the seeds and fiber. Combine the sliced pulp with the drained peel. To each pressed measure of this mixture of fruit pulp and

par-boiled peel, add twice that quantity of water and boil rapidly for about 40 minutes. Then measure this mixture and add to it an equal measure of sugar. Add $\frac{1}{8}$ teaspoon of salt. Boil the fruit mixture and the sugar rapidly for 25 minutes, or until thick and amber-colored. Stir the mixture as it cooks to prevent scorching. Let the marmalade stand in the kettle long enough for the shreds of peel to distribute themselves uniformly throughout the jellied juice—that is, until slightly cooled. Stir and pour into hot sterilized jars and seal, or pour into hot sterilized jelly glasses and cover with paraffin.

CARE AND USE OF CANNED PRODUCTS

After the products are canned, care must be taken in handling the glass jars to avoid breaking the seal. Remove bands from jars with self-sealing lids and with three-piece lids before storing. Intense light, heat or cold will cause a loss of color and a softening of the canned product.

Freezing will not cause canned food to spoil unless it breaks the seal and permits bacteria, yeast or mold to enter the jar. Freezing will break the cells which make up the food, however, and the texture and form of the product will be less desirable.

Store canned products on sturdy shelves. For efficient storage have shelves built just wide enough for 2 or, at most, 3 rows of cans or jars. A twelve-inch board is wide enough for 2 or 3 rows. Shelves should be about 10 inches apart for glass jars and a support placed about every 30 inches. Tin cans may be stacked in 2 or 3 tiers. Properly canned and

stored foods will keep almost indefinitely but the quality is better if used within the first nine months or year after canning.

Inspecting Canned Fruits and Vegetables

Before opening any kind of canned food, examine the can for signs of spoilage. Corrosion of the lid, any unusual deposit or sign of leakage about the rubber or on the can indicates an imperfectly canned product. Most spoilage is accompanied by gas formation and most foods are hot when placed in the can and shrink when cooled. For these reasons tin cans should be flat or curved slightly inward on both ends and all seams should be tight and clean with no trace of leakage.

When the jar is opened, if there is an outrush of air or spurting of the liquid, it indicates spoilage. If the air rushes inwards it shows the seal

was perfect. As soon as the jar is opened, test to see if the odor is similar to the fresh product, as an "off" odor indicates spoilage. The

contents should appear sound, natural in odor and the liquid free from cloudiness. All foods that show any sign of spoilage should be destroyed.

DRYING VEGETABLES

Drying is the oldest method of preserving food. In drying enough moisture is removed from the food that spoilage organisms cannot grow. Drying is a very desirable method of preservation to use when canning equipment or storage space is limited.

Dried foods add variety as they have a flavor and texture different from the same kind of fruit canned, brined, or preserved by some other method.

Drying Methods.—There are two main methods of drying—sun drying and drying with artificial heat. Drying with artificial heat is preferred for vegetables except herbs, mature beans, and mature peas. The greater the circulation of dry air, the faster evaporation occurs. The temperature should be as high as possible to dry the product from the inside out and still not cook the product. If the temperature is too high the product will become hard on the outside making it difficult for the inside moisture to escape. The best temperature for drying varies with the product being dried (from 125° to 165° F.). It is given in the directions for drying a specific vegetable.

Sun Drying.—For sun drying, place the food on a frame so air will flow under as well as over it. Some protection against insects, dust, rain, and dew should be provided. When the sun is very hot there is little difficulty from flies and other insects

but at such times the food needs to be stirred frequently to prevent overheating. A sloping roof with a south exposure makes an excellent place for sun drying. Place the food in the shade an hour or so before it is first placed in the sun. It should not be taken out in the sun until the dew is well dried in the morning. Remove the food before the dew starts forming in the evening.

Oven Drying.—Food may be dried in the oven. Place the food on large cookie sheets and keep heat low and constant and stir the material often to insure even drying. The oven door is left open to allow escape of moisture and to keep the temperature low. If the oven does not have a heat regulator use a thermometer and try to keep the food at the desired temperature.

Drying by Other Artificial Heat.—A simplified drier may be placed on a stove or over other sources of heat.

Equipment for Drying.—Expensive drying equipment is not necessary. A good drier fits over the stove or other unit of heat, favors rapid circulation of air around the food and protects it from dust and insects. A drier can be made easily from scraps of material found around most farm homes.

A good thermometer will help you keep the drying food at the right temperature. A dairy or canning thermometer is satisfactory for this purpose.

Use a large kettle with rack, a steamer or a pressure cooker for blanching or steaming the vegetables before starting the drying process. For storing dried foods, use containers that exclude air, light, and moisture.

Best Products for Drying

Not all vegetables dry successfully. Corn, herbs, mature beans and mature peas dry well and may be stored successfully until the next growing season. Snap beans, new peas, okra, pumpkin, squash, kale, and leafy green vegetables may be dried with some degree of success. These vegetables cannot be stored successfully for longer than 2 or 3 months as they develop a hay-like odor and flavor with long storage.

Sweet Corn.—Select corn in the milk stage or when just right for roasting ears. Start drying the corn as soon as possible after gathering. Field corn may be used but the dried product is not so good. Husk the ears and remove worm injuries—silking is unnecessary. Hold in boiling water or steam 8 to 12 minutes to set the milk. Young corn will require more heat than old corn. Drain, cool, and cut the grains off the cob making sure that no cob is removed with the kernels. Spread the kernels evenly on the trays $\frac{1}{2}$ to $\frac{3}{4}$ inches deep and start drying at a temperature of 165° F. Increase the heat as the corn dries. Stir frequently to separate grains and break up masses. The corn shrinks rapidly in drying, and when partially dry, the contents of three or four trays can be put into one, and the other trays made available for reloading.

In heating corn, watch carefully as it scorches easily.

When the corn is dry enough, the kernels are hard, brittle, semi-transparent and break like glass.

Mature Beans and Peas.—Navy beans, soybeans, lima beans, and mature peas are suitable for drying. Some varieties of pole beans make a desirable product if picked and dried when the beans are from two-thirds to three-fourths grown. Gather other beans when seeds are mature but before pods are yellow and dry. Shell and dip 3 minutes in boiling water. Drain and spread on trays about 1 inch thick. Dry at 115° F. to 120° F. to begin the process, allowing temperature to rise to 140° F. Stir frequently at beginning. The process is complete when beans and peas are dry and brittle and show no moisture at the center when split open. Many families let the beans stay on the vines until dry, then shell the beans, and immediately treat them for storage.

To Treat for Storage

Harvest beans and peas when they are mature and dry on the vines. Treat them soon after they are harvested so that all stages of insect pests will be killed. After treating, the beans and peas must be kept in a dry, tight container such as a lard can, other tin container, or glass jars, or they may become re-infested.

1. *Dry Heat.*—This method is generally used when small quantities are involved. Spread the dry shelled beans or peas to a depth of one-half to three-fourths inch in shallow pans and place in an oven with a temperature of 120° F. to 145° F. for 3 or

4 hours. If the seeds are to be used for planting do not let the temperature rise over 135° F. If you do not have a thermometer, judge the proper temperature by the hand. The pan or container should be just warm enough to handle comfortably.

2. *Stored in Hydrated Lime.*—Beans treated by this method must be very thoroughly washed before cooking. Mix one pound of hydrated lime to each 2 pounds of dry shelled beans, if a small quantity is being treated. If a large quantity is being treated use one pound of hydrated lime to 4 pounds of beans.

Seasonings.—Parsley leaves, mint, celery leaves, sage, dill, and other herbs, are *not* blanched before the drying process begins. Choose well developed plants. Wash, spread out on trays and dry at a temperature of 115° F. to 130° F. The herbs may be broken up when dry to save storage space. The drying process may be done in a cool oven, 150° F., with the oven door open. Some people dry herbs by using the heat left in the oven after baking. Others dry herbs by hanging them in the shade. When “bone dry”, store in containers that are air tight and moisture proof.

Onions

To successfully store onions, allow them to fully mature before harvesting. Cure them early, then store them in a dry place. Store only onions which are firm, not readily dented at the neck, thoroughly mature and well-shaped. They should show no sprouts or new roots, be well cured and thoroughly dry.

When harvested, spread the onions out on the floor of a shed, in a drive-

way or some shaded place where the sun does not strike them directly; also, where the air circulates freely in order to give excellent ventilation. When the onions are thoroughly cured, they may be stored. Slatted crates are ideal containers in which to put them, as the crates can be stacked so as to afford good ventilation. One common way of storing onions is to braid the tops, after they have been cured, and hang them from the top of the storage room or from the rafters of a building.

Conditioning the Dried Food

All pieces of food to be dried are not the same size and shape and consequently are not equally dry. So it is necessary to expose the product to a low temperature so the moisture can go through all the pieces and thus obtain a product with uniform dryness. This process is called conditioning. Keep the dried food in a shallow covered box in a warm place. Shake the box or pour the food from one box to another two or three times a day. No definite amount of time can be given for conditioning or curing the dried product. Corn can be finished in a day or two, while fruit will require about a week.

After conditioning, place the dried food in shallow pans and heat to a temperature of 165° F. to 185° F. for 10 to 15 minutes to make sure it is free from all insect eggs and other organisms which might cause the food to spoil. If a thermometer is not available put the food in a slow oven and heat until it is too warm to handle comfortably with the bare hands. Stir the food frequently during the heating.

Storage of Dried Food

Foods must be dry and cool before being stored. Pack them in containers that will exclude air, dust, light, moisture, insects, and rodents. Sirup buckets, tin cans, stout paper bags, and glass jars which are nicked or unfit for canning placed in paper sacks to exclude light are types of containers that might well be used for storing dried foods. Keep dried foods dry. Cloth bags are not desirable for storing dried foods as they are not moisture proof.

It is preferable to put the foods in small containers rather than in large ones since each time the container is opened some moisture will be absorbed by the rest of the food in the container. A number of small bags

may be filled, sealed, and placed in a lard can or a stone crock to store.

Keep the dried foods in a *cool*, dark, dry place. The food should be examined frequently and if there is any sign of moisture reheat the dried products to 165° F. and reseal. After a long rainy season examine the dried products to make sure they are dry. A moldy piece may give a bad flavor to a whole bag of dried food. Dried fruits, owing to their high sugar content, have better keeping qualities than vegetables. Green growing vegetables, that are dried, lose flavor and texture and develop a hay-like odor in a few months. Do not attempt to keep these products more than 2 or 3 months and then only in sealed containers.

STORING FRESH FRUITS AND VEGETABLES*

Many vegetables can be stored profitably in the fall for use during winter. Less work and expense are involved in storing vegetables than in canning, or drying them and the quality of a stored vegetable is frequently superior to the quality of a canned vegetable. Some vegetables, however, are at their best eating stage before the season is advanced far enough to make storage possible and then it is desirable to can the product.

Every vegetable, even though removed from the ground, vine or stalk where it grew, is still alive. It continues to carry on certain life processes with a continued exchange of gasses between the vegetable and the air. Successful storage must first provide conditions that will greatly

slow up these processes but at the same time provide for their continuance.

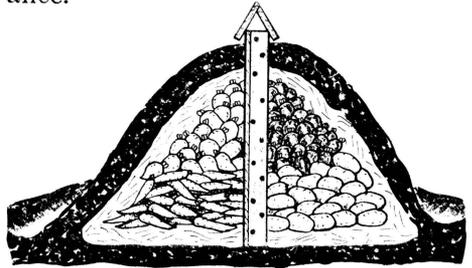


Fig. 3.—Outside storage pit for large amounts of vegetables. Note ventilation.

For success in storing vegetables have: (1) A good sound product in the proper stage of development, free from insect, disease or mechanical injury; (2) proper curing; (3) the right temperature; (4) favorable moisture conditions; (5) proper ventilation.

*Material on storage has been adapted from Extension Circular, "Storing the Family Food Supply," by Allen Purdy and K. B. Huff.

Vegetables may be stored in an outside cellar, a basement, a partly heated room or an outside pit or trench.

Various vegetables require very different storage conditions. They may be placed in 3 groups:

1. Vegetables, like root ones, need to be put in a cool *moist* place.
2. Vegetables like onions, require a cool *dry* place.
3. Vegetables like squash, pumpkin, sweet potatoes, need a *warm dry* place.

An outside cellar affords the most ideal storage place for those vegetables which require cool, moist conditions.

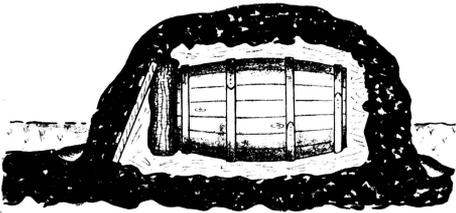


Fig. 4.—Barrel covered with straw and dirt provides safe storage for vegetables.

An outside pit, properly constructed and managed, will also afford good storage for root crops. The pit should be located in a well drained place with no danger of flooding during the storage season. A shallow pit, 6 or 8 inches deep is dug and lined with 4 to 6 inches of straw or leaves. The vegetables are then piled in a cone-shaped pile 2 or 3 feet high (depending upon the amount of vegetables to be put in the pile). Now cover the vegetables with a layer of straw or leaves about six inches deep and then 6 to 8 inches of dirt, leaving the straw stick out at the peak of the pile to afford ventilation until the weather

becomes severe. Cover straw peak with some material to keep out the rain. When the weather becomes colder, pile another layer of straw and a layer of dirt over the pit. The layers of straw afford dead air spaces that help prevent freezing.

It is better to put a variety of vegetables that require the same storage conditions in a number of small pits. Then when a pit is opened different kinds of vegetables are obtained and the entire contents can be removed to the house. When the weather is severe it is difficult to remove part of the vegetables without danger of frosting some of those left.

With a large pit a ventilator, built by nailing four 6-inch boards together, may be placed in the center before the vegetables are placed around it. Cover the top of this ventilator with a simple roof, as shown in the diagram, which will keep out the rain.

It is well to locate the pit on the north side of a building or in a well shaded place to protect it against the direct sun rays, especially if the pit is built early in the fall.

In making the mound the dirt used can be taken from close to the pit. This will make a ditch around the mound to carry off surplus water which might soak into the pit and cause spoilage.

Barrels and Boxes

Barrels and boxes may be used for storing fruit, cabbage and those crops adapted to pit storage. For this type of storage, set the barrels or boxes down in the ground, fill them with the crops and then cover

with alternate layers of straw and dirt. Or, place them on top of the ground and cover them with alternate layers of straw and dirt to insulate the crops against freezing.

The end to be opened may be covered with a sack full of straw against which is leaned some boards banked with dirt. This arrangement makes it easy to open and at the same time prevents freezing.

Trench Storage

Trench storage is another method of storing some crops which involves the same principles as pit, barrel or box storage. In this type storage dig a trench about a foot wide, line with straw and then place the crops in the trench. Such crops as Chinese cabbage, celery and sometimes

cabbage are stored in the trench. These are often wrapped in moisture-proof paper and placed in the trench. Or, remove them from their growing places with the roots attached and transplant into the loose dirt in the bottom of the trench. In either case, after the trench is filled, lay a covering of boards over the trench and then pile alternate layers of straw and dirt on top in order to insulate against freezing.

Carrots, Beets, Turnips, Rutabagas and Winter Radishes

All of these root crops should be harvested, if possible, when the ground is dry and the dirt does not cling. Twist or cut off the tops about a half-inch above the root to avoid excessive loss of moisture. If

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Vegetable	Temperature Requirements	Moisture Requirements	Ventilation
Beets	Cool - 32° to 40° F.	Moist	Limited
Carrots	Cool - 32° to 40° F.	Moist	Limited
Turnips	Cool - 32° to 40° F.	Moist	Limited
Winter Radishes	Cool - 32° to 40° F.	Moist	Limited
Rutabagas	Cool - 32° to 40° F.	Moist	Limited
Parsnips	Cold - Ordinary freezing will not injure	Moist	Limited
Salsify	Cold - Ordinary freezing will not injure	Moist	Limited
Horseradish	Cold - Ordinary freezing will not injure	Moist	Limited
Irish Potatoes	Cool - 36° to 40° F.	Medium	Limited
Cabbage	Cool - 32° to 40° F.	Medium	Medium
Chinese Cabbage	Cool - 32° to 40° F.	Medium	Medium
Celery	Cool - 32° to 40° F.	Roots Moist, Tops dry	Medium
Onions	Cold - 30° to 34° F.	Dry	Maximum
Squash	Warm - 40° to 50° F.	Dry	Maximum
Pumpkin	Warm - 40° to 50° F.	Dry	Maximum
Sweet Potatoes	Warm - 55° F.	Dry	Maximum
Beans (dry)	Unimportant	Dry	Unimportant
Peas (dry)	Unimportant	Dry	Unimportant
Corn (dry)	Unimportant	Dry	Unimportant
Canned Products	Above Freezing 32° to 80° F.	Dry	Unimportant

All of these except celery and Chinese cabbage may be stored all winter.

the tops are cut too close to the roots the fresh cut allows great evaporation and also a place for the entrance of rot organisms.

These roots store best at temperatures from 32° to 40° F. They require moist storage conditions to prevent shrivelling. The moisture in the storage place should be as high as possible and still avoid moisture on walls or ceilings or on the vegetables.

Some ventilation is necessary, particularly at the beginning of the storage period. At this time the roots are still giving off moisture. Considerable air is required to carry away this excess moisture and also to supply oxygen. As the storage period continues and the respiration slows down less ventilation is required. Root crops keep best in a dark place.

All root vegetables except sweet potatoes can be stored together. They are well adapted to storing in a simple outside cellar or cave or in a suitable basement.

Root vegetables may be piled on a dirt floor and covered with moist soil or placed in a box of sand or dirt which may be kept moist. If the storage place is dry, moisture may be added by sprinkling the floor or dampening the dirt or sand in which they are packed.

Small quantities may be successfully kept in a stone or earthenware jar covered loosely with boards. In this case it is not necessary to put sand or dirt over them. If they become wet, make wider openings in the cover to allow more circulation. On the other hand, if they start to shrivel cover them more tightly.

Irish Potatoes.—This crop is the first one to be ready for storage in Missouri. By following the simple rules of proper harvesting, curing, and storing they may be successfully kept throughout the winter.

Harvest Irish potatoes when about three-fourths of the vines are dry. This allows the skin of the potato to be fairly mature which protects them from evaporation and decay.

Handle potatoes and all vegetables carefully for they are made of living tissues. Bruises and injuries make them decay easily.

In Missouri, curing right after harvest is the most important step for success in storing Irish potatoes. Immediately after digging, pick up the potatoes and spread them thinly (not more than 2 potatoes deep) in a driveway, on a shed floor, or some place where the sun will not strike them; also, where there is plenty of ventilation.

While curing, the immature and injured potatoes can be easily seen, being thinly spread, and can be removed. If the potatoes can be carried through the first month without rot, storage during the following months should be successful.

After potatoes are cured, sort out the diseased, insect damaged or injured ones for immediate use. Store the healthy, sound potatoes in the coolest place you have. Slatted bushel crates made good containers for potato storage.

The best temperature for storing Irish potatoes is from 36° to 40° F. Avoid frosting as frosted potatoes are not good to eat and will not keep. Also, avoid temperatures of

50° F. and above as this encourages sprouting and shriveling.

To keep potatoes and other root crops from sprouting use one application of a commercial preparation, methyl ester of naphthaleneacetic acid. If used at the beginning of the storage period, apply this material according to the instructions on the package.

Ventilation is important in successful potato storage because respiration continues through the storage period. Naturally, there must be circulation of air to carry off excess moisture and carbon dioxide and to supply oxygen.

Keep potatoes entirely dark since light turns them green and the green portions are unfit to eat.

Potatoes may be successfully stored in pits, outdoor cellars or caves, in regular storage houses or in basements. The ideal storage temperature for potatoes is just a few degrees warmer than for other root crops. However, if other conditions are favorable, they may be kept at the same temperature. An ideal way to store potatoes is in slatted bushel crates stacked to permit free circulation of air on all sides.

Cabbage and Kohl-Rabi

Cabbage and kohl-rabi have similar requirements and may be stored together. Plant late in the season for the proper stage of development for storage. If properly grown, handled and stored they will keep throughout the winter.

To harvest for storage, pull them, leaving the stalks and dirt-free roots attached. This reduces the evaporation of moisture that may occur if the stalk is cut from the head. It

also lessens the chance of rot developing in the large cut surface.

In placing cabbage in storage the heads may be inverted with the stems and roots up. The second row may be placed on top of the first between the upturned roots and the third row alternating between the roots of the second. Turning the heads upside down allows excess moisture between the leaves to become more evenly distributed and thus lessens danger of decay. It is not necessary to stand kohl-rabi with roots up.

These vegetables may be stored in pits, or in barrels or boxes buried in the ground. Also they may be successfully stored in outdoor cellars, basements or storage houses with the root crops stored in crates on the floor and the cabbage and kohl-rabi placed upon shelves where the humidity is less. Often cabbage heads are wrapped in paper to avoid excessive moisture loss but this is not necessary if the humidity of the storage place is sufficient to prevent drying.

Cabbage and kohl-rabi are not injured by a light freeze if allowed to thaw slowly and are not handled during the time they are frozen. The best temperature for storing these crops is just above freezing, from 32° to 40° F. The moisture requirement for successful storage is the same as for Irish potatoes. That is, there should be sufficient moisture to avoid shrivelling but care should be taken to see that no moisture accumulates on the leaves.

Some ventilation is necessary to carry away the moisture given off in respiration, but the amount is somewhat less than with potatoes. Light is not an important factor in the

storage of these crops. A dark place, however, is preferable.

Pumpkins and Squash

The most important considerations in successfully storing pumpkins and squash are: first, allow them to ripen thoroughly on the vine and, second, store them in a dry fairly warm place that is well ventilated.

They may be harvested any time after the rind becomes hard, and before frost.

Pumpkins and squash should be removed from the vines leaving the fruit stalk attached to the fruit. If this stem is removed from the fruit, decay is apt to start at the point of detachment. Excessive evaporation also occurs. Considerable decay in pumpkins and squash may be avoided by dipping them in a solution made of one pint of 40% formaldehyde in six gallons of water.

The best temperature for their storage will range from 40° to 50° F. They should be kept in a dry place with a moderate amount of ventilation. The presence of some light is not harmful to their storage. They may be successfully stored on racks or shelves or in slatted crates in dry storage places.

Apples and Pears

Of the various kinds of fruits grown in Missouri, apples and pears are best adapted to home storage. Generally speaking, apples can be stored successfully for longer periods than pears. It is quite difficult to store either apples or pears that

ripen during late August and September for any extended period. This is because seasonal temperatures at this time of year, both in storage and outside of storage, are usually quite high. Varieties that ripen in October are much better adapted to usual farm storage. Under good storage conditions, two months would be a good storage season for pears and five months for hard winter apples.

As soon as the fruit is harvested place it in containers so it can be handled with the minimum of bruising. Place in storage as soon as possible. During this season air temperatures are usually cooler than the temperatures in basements, cellars and caves. Hence, a temporary storage in an open shed, the north side of a building, or some similar place will usually provide cooler temperatures than the caves and cellars. If the fruit is covered lightly with some material such as straw, blankets, etc., the fruit will not absorb the heat of the day and will remain cooler than if not so protected.

When temperatures reach a point where freezing is likely, remove the fruit from temporary storage and place in basement, cave or cellar. Handle in a manner similar to that recommended for root crops. If the individual fruits are wrapped with paper, they will be better protected from bruising and usually will store longer because fruits that start to decay will not contaminate adjoining fruits.