Canning Vegetables
4-H Food Preservation Project
Unit 4

MISSISSIPPI STATE UNIVERSITY EXTENSION

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Canning Vegetables

The two most common methods of preserving vegetables are freezing and canning. Freezing keeps the food so cold that microorganisms cannot grow, and enzyme activity is slowed down. When you can vegetables, you put them in a jar and heat them. You heat them enough to kill microorganisms that cause spoilage, and you seal the jar to keep microorganisms and air out. Canning is more work than freezing but is more economical.

You will learn these things in this project:

1. What causes food to spoil.
2. How canning prevents food spoilage.
3. The meaning of words related to food preservation.
4. How to determine the amount of vegetables to preserve for your family.
5. How to select vegetables for canning.
6. How to can vegetables.
7. How a pressure canner works.
8. How to use the vegetables you have preserved.

You will do these things in this project:

1. Determine the kinds of vegetables and quantity of each to care for your family's needs.
2. Can at least four different kinds of vegetables.
3. Exhibit your canned vegetables at county fairs and exhibit days.
4. Give a food preservation visual presentation.
5. Freeze and can fruits and vegetables that you learned to process in other food preservation projects.
6. Keep a complete record of foods you have frozen and canned.

You will learn these terms in this project:

- Raw Pack – the way you treat food before placing it in jars. In a raw pack, you do not cook the food before filling the jar. There are several advantages in using the raw pack: (1) the food requires very little preparation before it is processed; (2) it is almost impossible to over pack a jar that is raw packed; (3) there is less cleanup, since you use less equipment.
- Exhausting – when you process foods in a pressure canner, steam should escape, forcing out air before the pressure begins to rise. This is called exhausting.
- Hot Pack – place vegetables in large pan. Cover with water. Bring to a boil to precook (refer to specific vegetables for length of time to boil). Pack the hot vegetables in jars. Cover with the boiling liquid used to cook the vegetables in. Leave correct amount of head space.
- Head space – space left at the top of the jar after you put food into the jars.
- Precooking – when using the hot-pack method of canning, heat the foods in boiling water for a few minutes.
- Processing – heating the foods in the canner after you put the foods in jars.
- Vacuum Seal – when a jar lid seals while the contents are boiling hot, a vacuum forms as the jar cools.

What Causes Vegetables To Spoil?

Microorganisms

Molds, yeast, and bacteria are microorganisms found in the soil, water, and air, and on all surfaces they come in contact with. If these microorganisms are not destroyed by heat or stopped by cold, they cause food to spoil. They can also get into jars that are not sealed and cause canned foods to spoil. Because you cannot see yeast, molds, and bacteria without using a microscope, they are called microorganisms.

Micro means very small; and organism is a living thing. Molds form fuzzy patches on foods, causing a bad taste and sometimes developing toxins (poisons). Yeasts cause food to ferment, creating gases and off-flavors. Yeast and molds need air to grow; they are also easily destroyed by heat.

Bacteria can cause any number of spoilage symptoms, ranging from sour taste to gas formation to serious poisoning. Some bacteria grow best in a vacuum without air.

Enzymes

Enzymes are chemical substances that are present in all living things. They cause changes in flavor, texture, color, and food value. They cause vegetables to mature; if allowed to remain active, they eventually cause vegetables to spoil. To preserve food, you must destroy, stop, or slow them. Enzymes are destroyed by heat but not by cold.

How To Prevent Spoilage

To stop the spoilage of vegetables, you must heat them hot enough to kill the microorganisms, or you must keep them cold enough (0 ºF to 18 ºC or less) to keep them inactive. It is not hard to make food safe to eat, but you want the food to taste good and be good for you. Thus it is important to follow correct procedures that will result in a good product.

How Much To Can

Canned vegetables are best if used within a year. They will keep longer, but quality and nutritive value decline gradually. You should consider also how frequently your family will enjoy a certain vegetable. If they like green beans, for example, and would enjoy them once a week, you can plan on 52 jars of green beans.

Canning Vegetables

The acidity of food determines whether it can be safely canned at 212 ºF (in boiling water-bath) or must be heated to 240 ºF (in a pressure canner).

HIGH ACID

Boiling Water Bath (212 ˚F)	Pickles, citrus juices, sauerkraut, most fruits and berries, tomatoes
Pressure Canner (240 ˚F)	Tomatoes, peppers, figs, most vegetables, meats, eggs, poultry, fish, olives, hominy

LOW ACID

Acidity Scale

High acidity prevents the growth of Colstridium botulinum, a bacterium that produces a deadly toxin in vacuum-sealed products. Even if Colstridium botulinum spores (a bacteria "seed" that is not easily killed by heat) are present in canned high-acid foods, they cannot grow because of the acidity. In low-acid foods, such as vegetables, all spores must be killed by processing at 240 ºF because there is not enough acidity to prevent their growing during storage.

How Does a Pressure Canner Work?

How can the temperature of the water get higher than 212 ˚F? In a pressure canner, water is added, and the lid is tightly sealed. As the water comes to a boil, it changes to steam. The steam drives all the air out of the canner. When all of the air is out, the petcock (valve) on the pressure canner should be closed. Once it is closed, the steam cannot get out. It gets hotter and hotter and the pressure builds up. It keeps expanding and keeps getting hotter until it reaches 10 pounds pressure. The temperature is 240 ˚F (115.5 ˚C) by then. This is hot enough to destroy the botulinum spores.

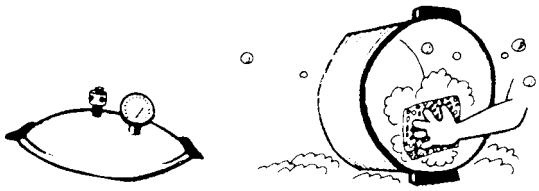
Many people are afraid of pressure canners. There is no reason to be afraid if you know what you are doing and follow the instructions.

Pressure canners have safety devices to keep them from "blowing up." But it is up to you to take care of the pressure canner to make sure it works correctly. There are two types of safety features. One is a rubber safety plug. If the pressure gets above 20 pounds in the pressure canner, the safety plug will pop out. The steam can then escape. When the steam escapes, the pressure inside the canner drops and will fall back to zero. It will then be safe to open.

The other safety device is a metal safety plug. It is made of metal alloy that melts when the temperature gets too hot in the pressure canner. When the alloy melts, steam can escape, and the pressure drops.

Another way to have a safely operating pressure canner is to keep it clean. If the petcock or the vent pipe where the weight rests becomes clogged with food, steam cannot escape. Pressure could come up too quickly. It is important to see if the hole is free from food. If it is clogged, draw a string through the hole.

Before using the pressure canner, read the directions carefully. Follow the manufacturer's directions.



Selecting Vegetables

Select only fresh, young, tender vegetables. Canning will not improve a bad vegetable. The canned vegetable will be as good as the fresh vegetable. The quicker the vegetable is picked and canned, the better it will be.

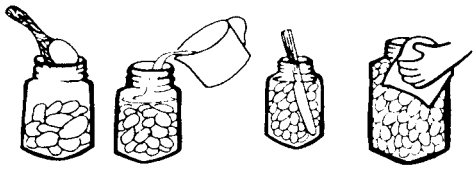
Wash vegetables in several changes of cool water soon after you pick them. This helps to cool them and remove bacteria and dirt from the surface. Refrigerate freshly-picked vegetables and can them as quickly as possible.

Wash canning jars, lids, and screw bands. Use only standard canning jars. These are tempered jars that are specially heat treated to stand the 240 °F reached in a pressure canner. Make sure there are no nicks or chips in the jar. They could keep the jar from sealing. If you do find a nick or a chip, throw the jar away. Use new jar lids. Do not use lids more than one time. The screw bands can be used more than one time if they are not rusty or bent.

Basic Steps

1. If you are going to use a hot pack, precook the vegetables. Pack the hot vegetables in a jar. Cover with boiling cooking liquid, leaving the right amount of head space.

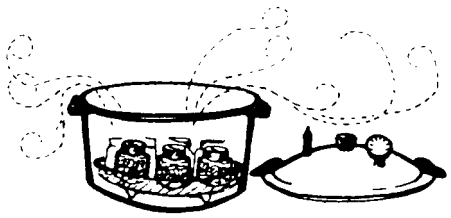
2. If you are using the raw pack, pack the food in a jar. You will want to pack it attractively, but do not waste a lot of time trying to make it look fancy. When the jar is full, add boiling water to the jar, leaving the right amount of head space. (See individual vegetables.)



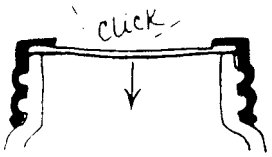
3. For either type of pack, use a plastic spatula or plastic knife to work out as many air bubbles as possible.

4. Take a clean, damp cloth and wipe the mouth of the jar. If any food particles are left on the jar, they could keep the jar from sealing. Heat the lids according to the directions on the lid package. Place the lid on the jar. Screw the band on according to the lid package directions. These may vary with different lids.

5. Add 2 inches of water to the pressure canner and heat. Be sure there is a rack in the bottom of the pressure canner. This will keep the glass jars from coming in direct contact with the hot metal. Even tempered glass can break if it is touching the hot metal canner bottom. Place the jars on the rack in 2 inches of hot water.



6. Adjust the canner's lid according to the manufacturer's directions. Follow the directions for exhausting your canner. Exhaust the canner by letting steam come out of the petcock. Exhaust it for 10 minutes. Then close the petcock or add the weight. When the pressure reaches 10 pounds, begin the processing time. Turn the heat down and keep the pressure at 10 pounds. If the pressure is allowed to fluctuate, liquid might be forced out of the jars. Check the pressure often. When the processing time is finished, turn off the heat, but DO NOT try to remove the lid until the pressure is at zero. When the pressure has completely dropped and steam no longer comes out of the petcock, wait two more minutes and remove the lid. Open it away from your face. Place the lid on a cloth on a flat surface and let it cool. Do not put the dial side of the lid on the cloth. Remove the jars and let them cool. Place them on a rack or cloth out of a draft. Leave for 12 to 24 hours.



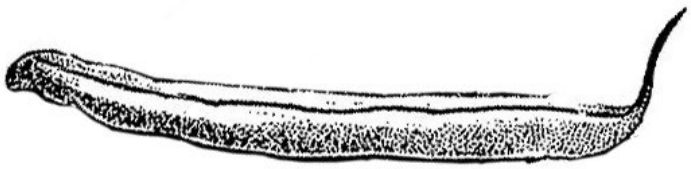
7. After the jars have cooled, test for a seal. During heat processing, air is pulled out of the jar, and a vacuum is formed when the jar is cooled. This pulls the lid down, and the jar is sealed. If the lid is not pulled down, there is not vacuum; the jar is not sealed; and the food will spoil. If you find any unsealed jars, you can store them in the refrigerator for one to two days, and you can use the contents as if they were fresh.
If the jar is not sealed, you can freeze the food or re-can it if you found the unsealed jar within 24 hours after it was canned. First check to see if the jar rim has a chip. If it does, that might be why the jar did not seal. Throw away the chipped jar or one with an uneven mouth. Use a new canning lid and seal the jar. Reprocess in a pressure canner for the original length of time.

8. If the jar is sealed, remove the screw band. Wipe the jar and label it with the name of the product and the date. Store jars in a cool, dark, dry place. Wash and dry the screw band. Store it in a dry place. Clean the canner and store it according to the manufacturer's directions.

Directions for Canning

Green Beans

Pick young, tender beans; 1½ to 2 pounds make 1 quart. A bushel (30 pounds) yields 15 to 20 quarts.



Raw Pack: Wash beans. Snap ends. Cut or break into 1-inch pieces. Pack raw beans tightly to within 1 inch of top. Add ½ teaspoon salt to pints and 1 teaspoon to quarts (if desired for flavor). Cover with boiling water, leaving ½ inch head space at top of jar. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 20 minutes
Quart jars – 25 minutes

Hot Pack: Wash beans. Snap ends. Cut or break into 1 inch pieces. Cover with boiling water. Boil 5 minutes. Pack hot beans loosely to within 1 inch of top. Add ½ teaspoon salt to pints and 1 teaspoon to quarts. Cover with boiling-hot cooking liquid, leaving 1 inch space at top of jars. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 20 minutes
Quart jars – 25 minutes

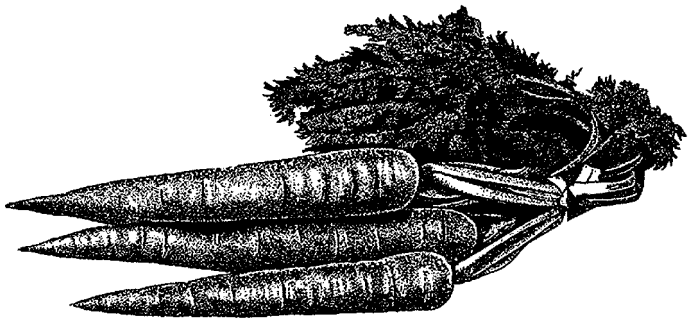
Beets

Select young or mature beets not more than 3 inches across; 2½ to 3 pounds make 1 quart. A bushel (52 pounds) yields about 20 quarts. Sort beets for size. Cut off tops, leaving an inch of stem. Also leave root. Wash beets. Cover with boiling water and boil until skin slips off easily – 15 to 25 minutes, depending on size. Skin and trim. Leave baby beets whole. Cut medium or large beets in ½ inch cubes or slices; halve or quarter very large slices. Pack hot beets to within 1 inch of top. Add ½ teaspoon salt to pints and 1 teaspoon to quarts. Cover with boiling water, leaving 1-inch space at top of jar. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 30 minutes
Quart jars– 35 minutes

Carrots

Select young, tender carrots; 2½ to 3 pounds make 1 quart. A bushel (50 pounds) yields about 20 quarts.



Raw Pack: Wash and scrape carrots. Slice or dice. Pack carrots tightly into clean jars, to within 1 inch of top of jar. Add ½ teaspoon salt to pints and 1 teaspoon salt to quarts. Fill jar to within 1 inch to top with boiling water. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

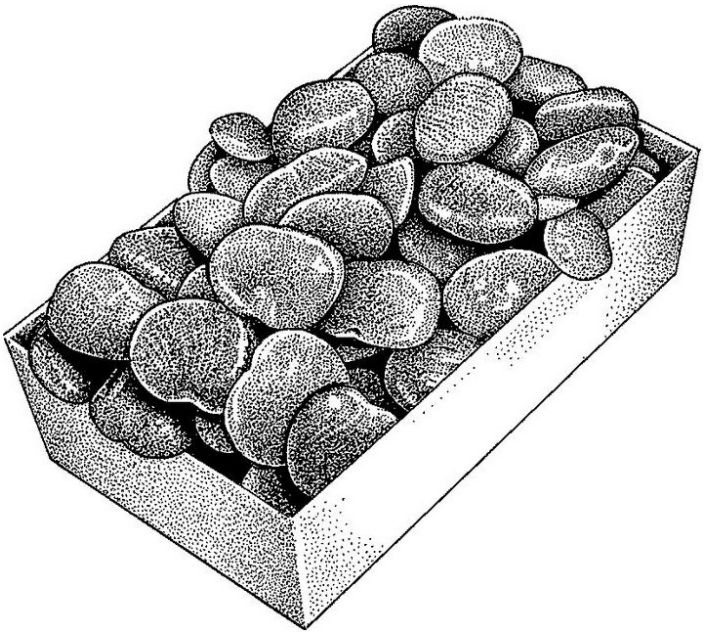
Pint jars – 25 minutes
Quart jars – 30 minutes

Hot Pack: Wash and scrape carrots. Slice or dice. Cover with boiling water and bring to a boil. Pack hot carrots to within 1 inch of top. Add ½ teaspoon salt for pints and 1 teaspoon for quarts. Cover with boiling-hot cooking liquid, leaving ½ inch space at top of jar. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 25 minutes
Quart jars – 30 minutes

Beans, Fresh Lima

Can only young, tender beans; 4 to 5 pounds in pods yield 1 quart. A bushel (30 pounds) yields 7 to 8 quarts.



Raw Pack: Shell and wash beans. Pack raw beans into clean jars. For small beans, fill to within 1 inch of top of jar for pints and 1½ inch for quarts. For large beans, fill to within 1 inch of top for pints and 1¼ inch for quarts. Beans should not be pressed or shaken down. Add ½ teaspoon salt for pints and 1 teaspoon for quarts. Fill jar to within 1 inch of top with boiling water. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 40 minutes
Quart jars – 50 minutes

Hot Pack: Shell the beans, cover with boiling water, and bring to a boil. Pack hot beans loosely from 1 inch of top of jar. Add ½ teaspoon salt to pint jars and 1 teaspoon to quarts. Cover with boiling water, leaving 1 inch space at top of jar. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 40 minutes
Quart jars – 50 minutes

Green Peas

Pick when pods are well-filled with tender green peas. Two to 2½ pounds peas in pods yield 1 pint. A bushel (30 pounds) yields 12 to15 pints.

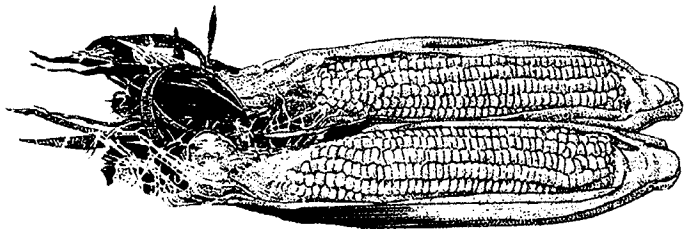
Raw Pack: Shell and wash peas. Pack peas to within 1 inch of top; do not shake or press down. Add ½ teaspoon salt to pints and 1 teaspoon to quarts. Cover with boiling water, leaving 1 inch space at top of jar. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 40 minutes
Quart jars – 40 minutes

Hot Pack: Shell and wash peas. Cover with boiling water. Bring to boil. Pack hot peas loosely to within 1 inch of top of jar. Add ½ teaspoon salt to pints and 1 teaspoon to quarts. Cover with a boiling-hot cooking liquid, leaving 1 inch space at top of jar. Wipe jar rims clean. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 40 minutes
Quart jars – 40 minutes

Cream Style Corn



Hot Pack: Husk corn and remove silk. Wash. Blanch ears 4 minutes in boiling water. Cut corn from cob at about center of kernel and scrape cob. To each quart of corn add 1 pint boiling water. Heat to boiling. Use pint jars only. Pack hot corn to 1 inch of top. Add ½ teaspoon salt to each jar. Adjust jar lids. Process in dial gauge pressure canner at 11 pounds pressure or in a weighted gauge pressure canner at 10 pounds pressure.

Pint jars – 85 minutes

Using Canned Vegetables

When you get ready to use home-canned vegetables, look closely to make sure the jar is sealed. If it is not sealed, throw it away. If there is a soured odor or off-odor, foam, or spurting liquid when you open the jar, throw the food away. To make absolutely sure that all home-canned low-acid foods are safe to eat, you should boil them before you taste them. Boil all home-canned vegetables 10 minutes before you taste them. Home-canned vegetables should be safe to eat if you use the correct procedures, but do not take a chance. Boil before you taste!

Fruited Carrots

1 pint canned carrots, drained
1 cup pineapple chunks with juice
1/2 cup of orange juice
1/2 tablespoon cornstarch
1/2 teaspoon salt
1/4 teaspoon cinnamon

In medium saucepan, blend cornstarch with orange juice and juice from pineapple chunks. Heat, stirring constantly until thickened. Add pineapple chunks, carrots, salt, and cinnamon and cook, covered, over low heat for 15 to 20 minutes. Makes 4 servings.

Green Bean Casserole

1 pint canned green beans, drained
1 10 1/2-ounce can mushroom soup
1/4 cup milk
1 3 1/2-ounce can French fried onion rings

Place half of green beans in a greased 1-quart casserole dish. Combine soup and milk and spread half of mixture over beans. Sprinkle with half of onion rings. Repeat layers with the other half of ingredients. Bake for 25 to 30 minutes at 350 °F. Serves 4 to 6.

Cranberry Beets

1 pint canned sliced or diced beets, drained
2 teaspoons cornstarch
2 teaspoons sugar
1/4 teaspoon salt
1/2 cup cranberry juice
1/4 teaspoon grated orange peel

In saucepan blend cornstarch, sugar, and salt. Stir in cranberry juice and stir over medium heat until thickened and bubbly. Add beets and orange peel. Simmer, uncovered, for 10 minutes. Makes 4 servings.

Calculate the Cost

The amount of money you will save on your family's food bill is hard to figure because of the differences in costs of supplies and fuel. If you preserve food from your garden, the savings will be considerably more than if you purchase raw vegetables to process.

To get an idea of the value of your products, visit the grocery and see how much the same size container of each of the vegetables costs. Multiply the cost times the number of containers you preserved. You should be pleasantly surprised at the value of your products.

Exhibits

Share what you have done in your project with others by putting your canned vegetables on display. Most counties have a county fair exhibit day where 4-H projects can be displayed. Outstanding exhibits are selected at the county level to be exhibited at the Mississippi State Fair. Check with your 4-H leader and county Extension agent for details.

Visual Presentations

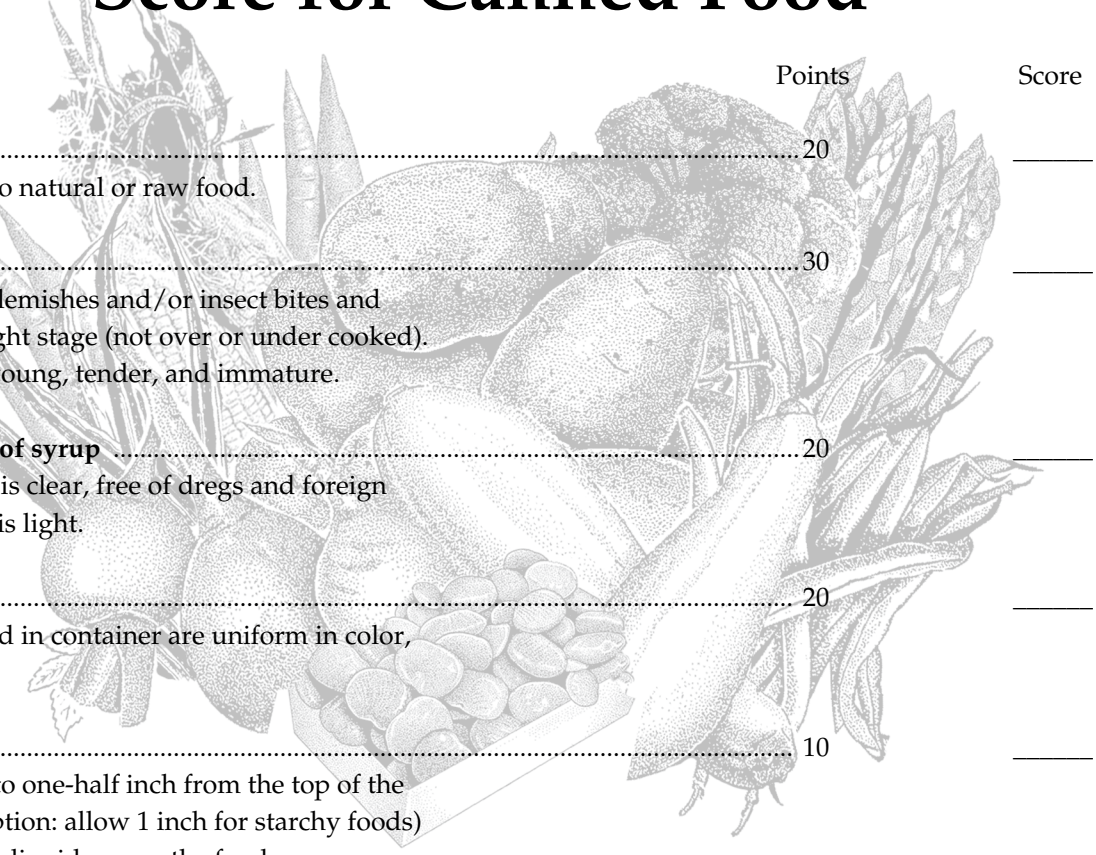
One of the best ways to teach others how to preserve food is by giving food preservation visual presentations. You can show others what you have learned and help them see the value of canning vegetables for home use. Here are some presentation topics you may want to use:

- How To Operate a Pressure Canner
- Selecting Vegetables for Canning
- Canning Equipment and Its Use
- How To Fill and Seal Jars
- Safety Tips in Food Processing

4-H Project Leader

You might want to serve as a leader for younger members in the food preservation project. Sharing what you have learned about food preservation can help you develop your leadership skills as well as help others learn to preserve foods. Ask your 4-H leader or county Extension agent for details on serving as a 4-H project leader.

Score for Canned Food



	Points	Score
Color — Food is similar to natural or raw food.	20	_____
Condition — Food is free of blemishes and/or insect bites and cooked to the right stage (not over or under cooked). Vegetables are young, tender, and immature.	30	_____
Clearness of liquid of syrup — Liquid or syrup is clear, free of dregs and foreign material. Syrup is light.	20	_____
Uniformity — All pieces of food in container are uniform in color, shape, and size.	20	_____
Pack — Food is packed to one-half inch from the top of the container (Exception: allow 1 inch for starchy foods) and the syrup or liquid covers the food.	10	_____
Total Possible Score	100	_____

4-H Project Record for Canning Vegetables

Name _____ Date _____

Name of 4-H club or project group _____

Age _____ Grade in school_____

1. What are the most important things you learned in this project?

   _____

   _____

   _____

   _____

2. How many food preservation project group meetings did you attend? _____

3. List any assistance you have given to other 4-H'ers with their food preservation projects.

Number helped	Kind of assistance given
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

4. List talks and demonstrations given which relate to this project. (Include radio and TV appearances.)

Topic	Number in audience	Indicate number of times given on each level*
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

* Levels: Local (L), County, (C), District (D), State (S)

5. List awards and recognition received in this project.

Type of award	Indicate level*

* Levels: Local (L), County, (C), District (D), State (S)

6. Vegetables Canned

Date	Name of vegetable	No. of jars	Size of jars	Total

7. List other foods you froze or canned this year.

Date	Food	No. and size of jars or packages	Indicate method of preparation (pressure canner or boiling water bath)

GRAND TOTAL CANNED: Pints_____ Quarts_____

8. On a separate sheet of paper, write a story about what you did and learned in your food preservation project.

4-H Club Pledge

I Pledge:

My Head to clearer thinking,

My Heart to greater loyalty,

My Hands to larger service, and

My Health to better living for

My Club, My Community, My Country,

And My World.

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Revised and distributed by **Brent Fountain**, PhD, RD, CSSD, FAND, Human Nutrition specialist. Revised from materials originally prepared by the University of Kentucky College of Agriculture.

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