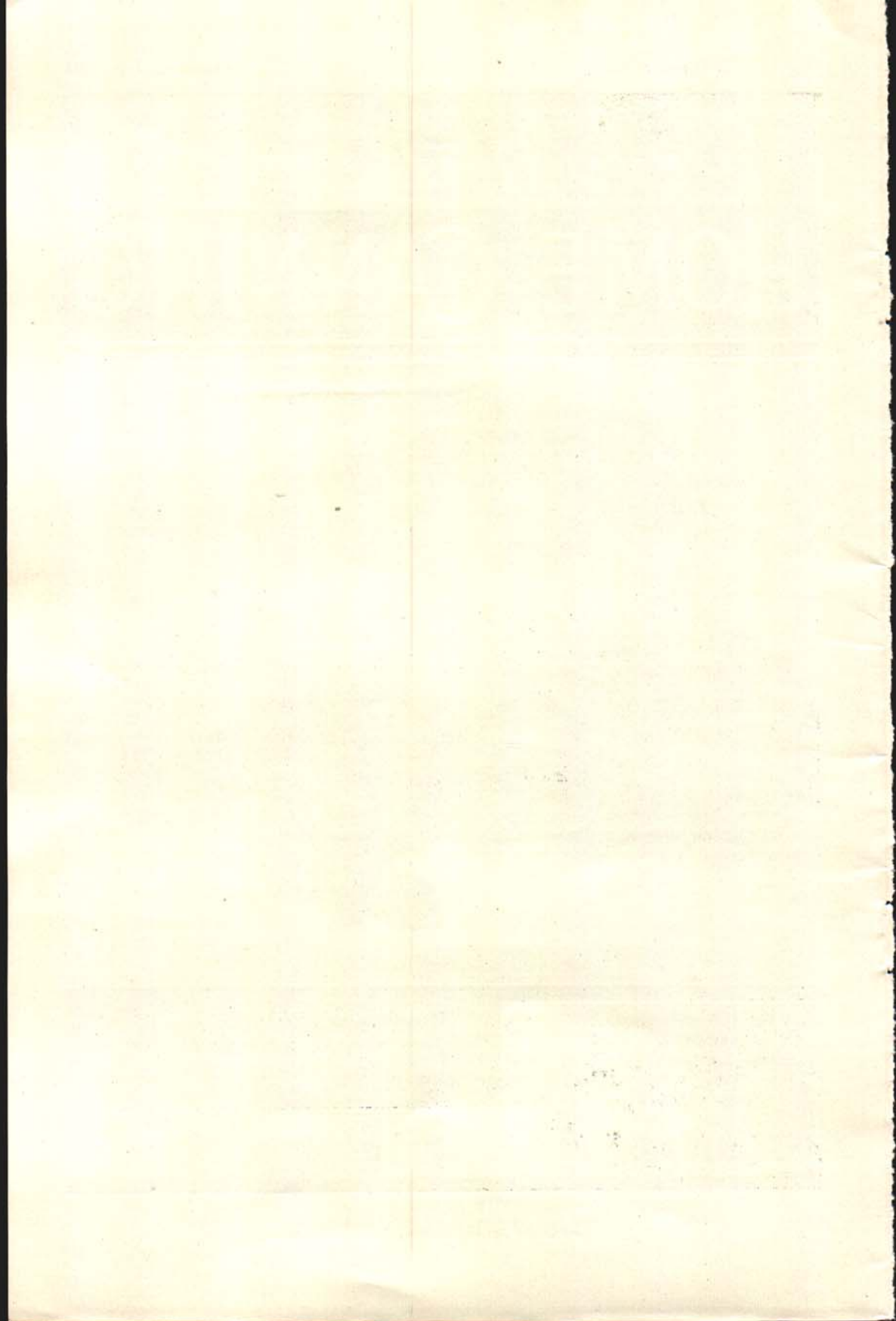


Successful **HOME CANNING**



MICHIGAN STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE
EXTENSION DIVISION
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SUCCESSFUL HOME CANNING

MURIEL DUNDAS GILBERT

Modern methods make it possible to can successfully, at home, the surplus, fresh garden products, which have the best flavor and quality. This helps many families to secure a more nearly adequate diet when food budgets are limited.

Safeguarding the health of the family is accomplished most readily by including plentiful supplies of fruits and vegetables in the year-round diet. Supplies of iron, calcium, and phosphorus, as well as the vitamins necessary to growth and maintenance of health, are made available through the use of these foods. To promote the best health, at least two servings of vegetables besides potatoes and two of fruit should be provided daily. Well filled storage cupboards are the best assurance of attaining this standard for the family meals. Much time and effort in meal preparation is saved by canning and storing the amounts of foods listed in the suggested budget for fruits and vegetables on page 4.

Success in canning is dependent upon an understanding of the causes and the control of spoilage, the availability of quality products to be canned, and the ability to follow directions accurately. Out-moded canning methods may be distinctly dangerous, even though apparently satisfactory over a long period of time. Absolute cleanliness of all canning operations, freshness of products to be canned, and adherence to time periods specified for processing or application of heat will insure a maximum degree of success.

WHY FOODS SPOIL

Foods are spoiled by molds, yeasts, bacteria, and enzymes. The minute living organisms are present in air, water, soil, and on all surfaces exposed to air.

Molds are visible in their growth upon the surface of food left in damp places. They grow in the presence of acids and are easily destroyed by heating. Molds require oxygen, moisture, and heat, and use sugar and starch as food. They may also grow in the presence of acid, hence are often found upon fruits and tomatoes. They reproduce themselves by means of spores. Fruit that has been open soon molds due to the entrance of spores. Small flecks of mold are not harmful but a heavy growth of mold will affect taste, flavor, and texture. Such foods should be discarded.

SUGGESTED BUDGET—FRUITS AND VEGETABLES

Approximate amounts to be used for one year for each person in the family.

Kind or type of vegetables	Amounts to be used fresh in season	Amounts to be stored or canned for use in out of season months	Number of servings a week
Greens (spinach, turnip tops, beet tops, chard, wild greens, lettuce, endive, broccoli, kale, brussels sprouts).....	15 pounds	15 pints	2
Cabbage.....	5 pounds	20 pounds	2
String beans, asparagus.....	10 pounds	15 pints	2
Green peas, lima beans.....	25 pounds	12 pints	2
Green corn.....	30 ears	2 pounds (dried) 12 pints	2
Beets, carrots, squash.....	35 pounds	50 pounds 6 pints	2
Turnips, parsnips, rutabagas, sweet potatoes.....	12 pounds	25 pounds	1
Onions.....	12 pounds	25 pounds	1
Celery.....	2 pounds	5 pounds	.....
Potatoes.....	50 pounds	2½ bushels	7
Beans (dried).....	.....	12 pounds	1
Tomatoes.....	25 pounds	36 pints	3-4
Total.....	.....	96 pints	26
Fruits:			
Rhubarb.....	5 pounds	5 quarts	1
Cherries, berries.....	30 quarts	20 quarts	3
Plums, peaches, pears.....	½ bushel	25 quarts	4
Grapes.....	10 bunches	.....	.....
Apples.....	15 pounds	2 bushels	5
Melons.....	4 pounds	.....	.....
Prunes, raisins, dates, figs..	.....	10 pounds	1
Total.....	.....	50 quarts	14

NOTE: (a) Tomatoes may be replaced with oranges, grapefruit, or lemons.

	Servings
1 pound root vegetables.....	2
1 quart canned vegetables.....	8
1 pound greens or cabbage.....	4
1 quart canned fruit.....	6

Yeasts are one-celled plants responsible for fermentation of fruits. They require air, food, and a moderately warm temperature for growth. They are readily killed by heating. They cause much of the spoilage in canned fruits due to the formation of carbon dioxide. This causes the tin can to swell and breaks the seal on the glass container.

Bacteria are more resistant to heat and are present everywhere in enormous numbers. They are destroyed by heat in the presence of acids and grow best in a non-acid medium, hence cause most difficulties in canning vegetables and meats. Many bacteria have two forms, the growing and the resting or spore form. The former are destroyed by the temperature of boiling water after a few minutes.

Spores of some species are more resistant and will withstand several hours boiling. This is one of the chief causes of difficulty in canning and explains the need for canning non-acid vegetables and meats by the pressure cooker method.

Some types of bacteria cause the production of gases, among them, carbon dioxide and hydrogen, which cause pressure in the containers. Other gases may be detected by peculiar odors when containers are opened.

Another type produce acids of the flat sour type. The foods have a characteristic acid flavor. Quick cooling is a factor in controlling this type of spoilage because much of the growth takes place at relatively high temperatures, 110° to 150° F. Foods packed hot must be quickly processed for the same reason. Less spoilage occurs in foods stored at low temperatures.

When the liquid becomes cloudy it may indicate spoilage, though some starchy foods show a similar appearance. The presence of any unusual odor or flavor is sufficient reason for discarding canned products.

One of the most difficult types of spoilage to detect is that in which bacteria produce poisons known as toxins. Their presence cannot be detected by appearance or odor usually, and the only safeguard is the boiling of the vegetable in an open kettle.

Enzymes are chemical substances which bring about the ripening of fruits and vegetables and ultimately cause their decay. In canned foods, too little processing may permit continued enzyme action which shows itself in the browning of the top of product which will affect the taste and flavor of the product.

DETECTION OF SPOILAGE IN CANNED FOODS

Before opening containers, all canned foods should be carefully examined. Tin cans should have both ends flat or slightly depressed, not bulged. The metal cover on a glass jar should be firm, flat, or slightly curved inward. There should be no sign of leakage around the cover. The contents should appear firm, not mushy, and the liquid should not show cloudiness.

There should be no spurting of air or liquid from the container when it is opened. The color should be natural with little bleaching and the inside of the can should be clean and not show extensive discoloration or corrosion. The odor should be characteristic of the product. Sour or disagreeable odors probably indicate spoilage. Any suspected food should be burned or buried deeply, not given to chickens or animals.

NOTE:—All meats and non-acid vegetables canned by other means than the pressure cooker must be boiled for 10 to 15 minutes before they are tasted. A taste may be dangerous in spite of appearance and

odor giving no indication of spoilage. If no disagreeable odor develops during the boiling, it may be considered safe, as the boiling temperature will have destroyed the poison manufactured by the botulinus organism should it be present.

METHODS OF CANNING

(1) Hot pack: The method that is proving most successful for home canning is a combination of open kettle and cold pack methods. Vegetables are prepared as for the table, are packed boiling hot into clean sterile containers, and are then processed in pressure cookers or other type of canner for specified periods depending on the nature of the product.

Placing jars of fruit filled with hot syrup in a container with boiling water to cover them, and processing them for specified time has proved satisfactory for canning fruits and tomatoes. The water must be over the tops of the containers.

(2) Oven canning: Fruits and tomatoes are particularly well suited to this method of canning, although other vegetables may be canned successfully if acid is added, and the time of processing is sufficiently long, in an oven with a heat control appliance.

The steam pressure method is advantageous because processing is less expensive in fuel, time, and energy. There is a minimum amount of spoilage in meats and vegetables. The initial cost of the equipment is the principal objection to this method.

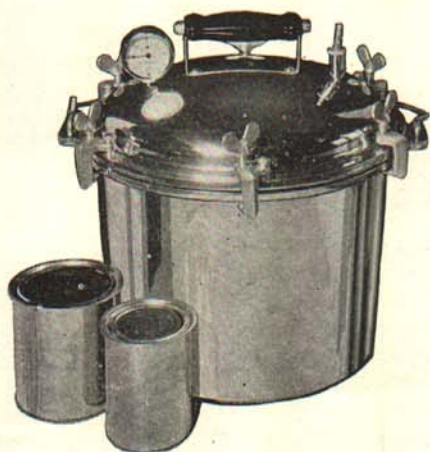


Fig. 1. The pressure cooker saves time and fuel, and insures successful canning.

CANNING EQUIPMENT

(1) A pressure cooker: Economy of time, fuel, and labor are considerations in the purchase of equipment, but the greatest argument in favor of the pressure cooker is the safety of the products canned. The Bureau of Home Economics does not recommend any other method for home canning of non-acid vegetables and meats. The pressure cooker is a heavy metal container with a tight fitting lid which when clamped in place makes it possible to hold steam under pressure and to obtain a temperature much higher than the boiling temperature. At five pounds pressure, the temperature is 228° F.; at 10 pounds, 240° F.; and at 15 pounds, 250° F., thus making possible the destruction of micro-organisms much more quickly than with the water bath outfit. The newer pressure cookers are equipped with thermometers as well as pressure

gauges. A consideration in their purchase would be the size of the family, the amount of canning to be done, and the desirability of using the cooker for cooking processes ordinarily requiring long periods of time.

(2) A water bath canner: A container large enough to hold a number of jars, with a rack of metal or wood to permit the free circulation of heat, and deep enough to allow two inches of water over the tops of the jars. It must be supplied with a tight fitting cover. This type of equipment is adapted to the canning of fruits and tomatoes.

(3) Containers of glass or tin: Many types of glass jars are available which are suited to every purpose. Selection of wide-mouthed jars for ease of packing is desirable. Clear glass is preferable since it gives an accurate picture of the contents. Simple construction requiring little time and effort in sealing is desirable. Tin cans are easily packed and sealed and can be cooled quickly. There is no loss of liquid during processing. They are obtainable in sizes corresponding to half pint, pint, and quart jars—No. 1, 2, and 3. Not all sealing devices are equipped to seal the smallest size since most canning is done in No. 2 and 3 tins.

(4) A sealing outfit is necessary if tin cans are used: This device turns the metal cap over the rim and crimps it flat. It has a cutting roll and provides for the reflanging of the shortened tin cans for use a second and third season. The caps provide a paper gasket or a sealing composition which will insure a perfect seal.

(5) Utensils for grading, sorting and washing: Shallow trays, pans, bowls, spatula, stiff vegetable brushes, spoons, measuring cups, colander or sieve.

(6) Knives: Sharp, stainless paring knives to prevent discoloration of the product.

(7) A jar lifter for handling the hot jars.

METHODS OF PROCESSING

Operation of the Steam Pressure Cooker

1. Have sufficient water in the cooker to prevent the possibility of its becoming dry (2 to 3 cups).

2. Tighten clamp or clamps opposite pairs at a time, so that no steam escapes except at petcock.

3. Leave petcock open until steam escapes in steady stream. Allow 7 to 10 minutes before closing, to insure escape of air and accurate temperature within the cooker.

4. Close petcock and allow temperature to rise until gauge registers the desired steam pressure. Begin to count time when desired pressure is reached.

5. Maintain a uniform pressure during the processing period, for fluctuations in pressure are likely to result in loss of liquid from the jar. The pressure may be kept uniform by regulating the heat under the cooker.

6. At the end of the processing period, the canner may be removed from the fire. It is necessary that the pressure be allowed to fall to zero before opening the cooker if glass jars are used. With tin cans

the petcock may be opened at once and the steam allowed to escape. This permits the rapid cooling of tin cans, an important factor in the prevention of flat sour. Products should be kept under observation for a week at room temperature, then labeled, dated, and stored in a cool place.

7. The pressure cooker should be thoroughly washed and dried after using. The safety valve should be cleaned but the steam gauge must not be immersed in water. The cooker should be put away uncovered.

8. The pressure cooker may be used as a water-bath for processing fruits without clamping on the cover. Only enough water to cover the rack is used, and the pet-cock should be left open. The time must be counted as for water-bath. Many people have found that processing at 2 to 5 pounds pressure is a satisfactory method for canning fruit.



Fig. 2. The water-bath outfit can be readily assembled for home use. A lard can will last for the season.

Use of the Water-Bath Method

Application of heat to products in glass jars or tin cans may be by means of boiling water in a large metal container fitted with a rack. Lard cans, enamel pails or kettles or any utensil with a tight cover may be used. A wire basket may be used and this device facilitates the removal of jars. Space must be ample for the circulation of water under and around them. Count time when the water boils. If water goes below tops of cans during processing period liquid is withdrawn from the jars. Keep a kettle of boiling water ready and refill water-bath, if necessary, to keep at least two inches of water over tops of jars.

The processing time depends upon the character of the product, the amount of acid, the fiber contained, as in greens, and the starch content.

All of these factors affect the rate of heat penetration to the center of the jar. Mature vegetables are more difficult to process than young tender ones. The larger the diameter of the container the longer time must be allowed for the heat to reach the center. No. 3 tin cans are not advocated for peas, corn, and greens for this reason.

The type of pack influences the rate of heat penetration, and undoubtedly much spoilage is due to too great crowding of the product in the jar.

The length of the processing period is dependent upon the character of the product. The presence of acid in fruits and tomatoes permits easy preservation hence a few minutes at boiling temperature will bring about sterilization, while non-acid foods furnish the ideal conditions for bacterial growth.

Spoilage with the water-bath method of canning is minimized by speed in getting the jars in the boiling water, not allowing the jars to stand after the preliminary preparation.

Oven Canning

Gas and electric ranges with heat-controlled ovens are being used successfully for the canning of fruits and tomatoes. Non-acid vegetables may be canned by this method if sufficient time is allowed for processing, usually a longer period than with the water-bath method. Some authorities recommend the addition of lemon juice to non-acid vegetables as for the water-bath method. Jars are packed as for water-bath or pressure cooker: Glass jars are filled to within an inch of the top and partially sealed. Tin cans are not used for oven canning, since partial sealing is necessary, otherwise the seal is broken by the accumulated steam and there is damage to the oven.

Glass jars should be placed far enough apart to allow free circulation of air.

Preheat the oven and set the temperature for 250° to 275°. The jars should be processed for the time specified in tables. Remove from oven and seal immediately. Cool and store jars as suggested for other methods.

Higher temperatures cause discoloration and over cooking of products, and loss of liquid through evaporation. The temperature within the jars approximates that of the water-bath since there is no pressure created.

The rate of heat penetration is slower in the oven hence the time recommended is longer.

Oven canning is not recommended for meats.

Addition of Acid in Canning Vegetables

Since products containing acid are more easily preserved the successful canning of the non-acid vegetables such as corn, peas, string beans, greens and asparagus may be facilitated by the addition of lemon juice. The amount advocated is one teaspoon to each pint for the above products except corn to which two teaspoons may be added. Vinegar may be used instead of lemon juice but the flavor is more pronounced. This amount is not sufficient to make any pronounced change in the flavor of the product. It may be used with water-bath or oven canning but is not necessary with the pressure cooker.

Containers

Glass jars can be used for several seasons, hence the initial cost is spread over a longer period of time. As far as quality is concerned there is no difference between the green and white but appearance of the product is enhanced by the clear white glass jar, especially for exhibition purposes. Tops may be glass, or the porcelain-lined zinc type or the metal cap with a rubber composition, and a metal rim which may be removed when the product cools. Glass jars must be examined

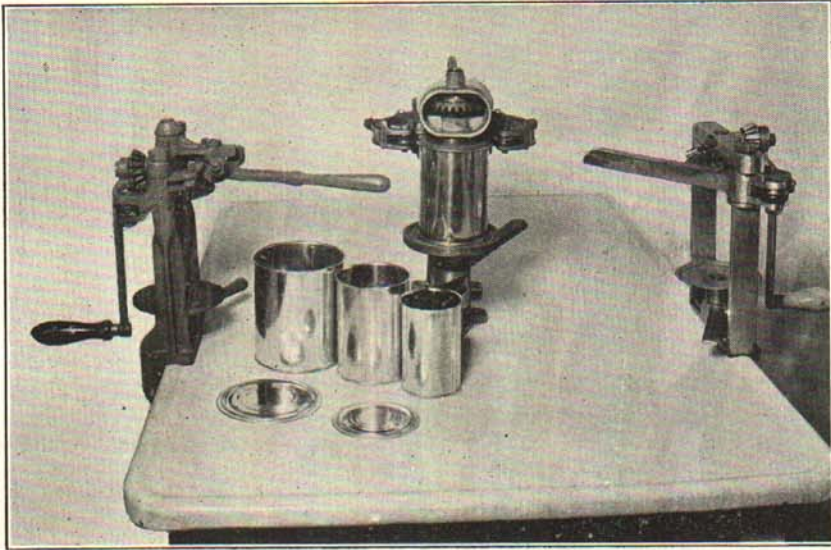


Fig. 3. Tin cans and sealing devices bring commercial methods into the home.

for cracks, nicks, or rough spots which would injure the rubber ring, and jars and covers must be tested for leaks before beginning the canning process. Metal caps should have the porcelain lining fitting tightly. They must be replaced every two or three seasons.

New glass jars may be tempered by placing in cold water and bringing to the boiling point.

Tin cans are of three types: Plain cans are ordinary tin cans used for most products with low acid and protein content. Plain tin discolors some foods such as corn and fish.

Enamel cans have a coating inside which will prevent color changes when red fruits and vegetables are canned. They should be used for all red fruits and most acid fruits.

C enamel cans are used for foods which contain sulphur such as corn, peas, and fish. They should not be used for products which contain acids.

Caps

Spoilage may be caused by using caps which have been used on jars in which products have spoiled, due to resistance of bacterial spores to heat. If such caps are used a second time they should be boiled thoroughly in acid or alkaline solution. Caps used should be perfect, not bent, pried or chipped. In a mason cap a perfect seal is indicated by a cap that is curved downward not bulged. Any that show signs of bulging or cracks should be discarded.

Containers must be thoroughly washed in hot water. Jars that have been stored in damp places may have mold growth inside, new jars and tin cans may be dusty. Tin covers may be wiped clean with a damp cloth but those with paper gaskets must not be dipped in water. They may be sterilized by placing in the oven for ten minutes.

Jar Rings

Tests for the elasticity of the jar rings are: (1) stretching to double the size and finding that the ring returns to natural size, and (2) folding and creasing the rubber and watching for signs of cracking.

SELECTION OF PRODUCTS TO BE CANNED

Use only fresh, sound, young products for canning. Old, withered, un-sound vegetables may be used for other purposes but are not desirable for canning. Over-ripe fruit will disintegrate and cause cloudiness of the liquid. For choice products a safe rule is "one hour from the garden to the can". Products that are bruised or decayed should be discarded because of the difficulty in sterilization and the great danger of contamination.

GENERAL RULES FOR PACKING

1. Containers should be packed as tightly as appearance and quality of product permit. Large pieces should not be crowded into the neck of glass jars so that they prevent heat circulation. Corn and lima beans tend to swell hence should not be crowded. Greens, with their high cellulose content are difficult to process if packed too closely.

2. Products should not be prepared and packed long in advance of processing time. If they must stand, cold liquid should be used instead of hot, otherwise the danger of flat sour is increased.

3. Tin cans must be packed hot, or the containers must be **exhausted** by setting them in a hot water-bath and heating for 10 minutes, then they must be removed and sealed while the contents are hot. If boiling liquid is added, they may be sealed at once, since this is sufficient to expel the air.

4. Glass jars are not completely sealed at the time of packing hence liquid may be either hot or cold, preferably hot. The air is expelled during processing.

SEALING AND STORAGE

After processing, glass jars must be sealed completely, tested for leaks by inverting in the hand, and allowed to cool. There is no advantage in inverting or laying jars on the side and there is danger of breaking the seal by this method. They should not be tightened further as this may break the seal. Jars with metal tops should never be inverted.

Tin cans are cooled by placing them in cold water, then dried quickly.

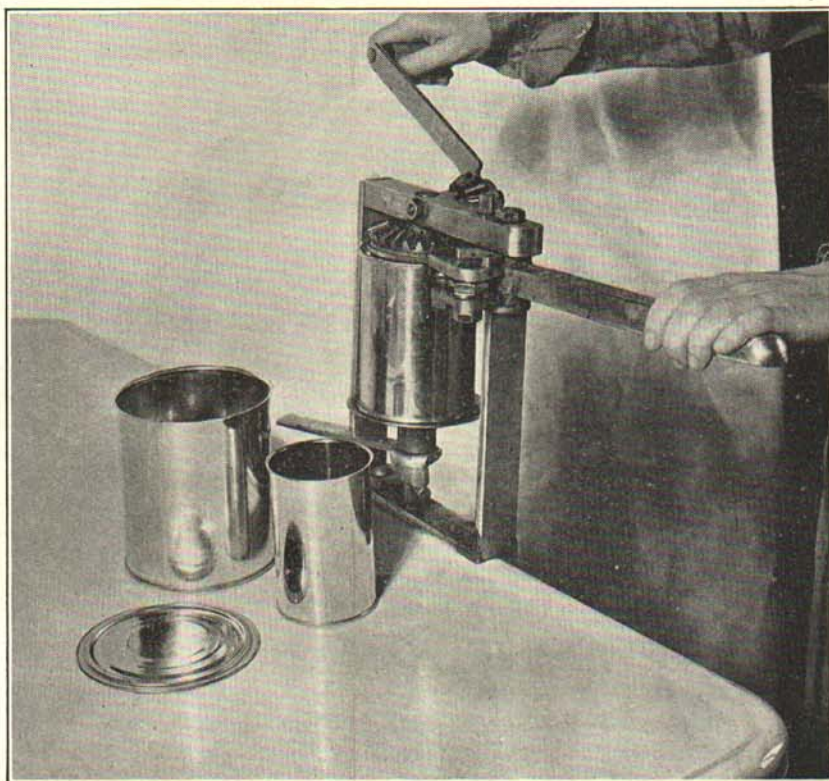


Fig. 4. Sealing devices are easy to operate. Tin cans are economical for they may be used for three years.

STORAGE

Canned foods will keep better if stored in a cool place. Occasional inspection is desirable. Canned foods should not be kept for longer than a year. The cans may perforate due to action of acids. If discovered early, the contents may be used at once.

Glass jars should be stored in a dark room to prevent fading of the contents.

Gummed paper labels with the name of the product and the date of canning are useful markers.

Imperfect Seals

In case the rubber or cover is defective, replace quickly and return to water-bath for five minutes in the case of fruits. For non-acid vegetables or meats, one-fourth to one-third of the processing time is required. If the jar is defective, the product would require repacking. This probably would not be desirable since it would necessitate the repetition of the processing time, and the product would not be of good quality. Never remove cover to add more boiling water or sirup, without reprocessing.



Fig. 5. Glass jars must be clean, free from imperfections. Covers must fit perfectly and jar rings must be new.

SOME CANNING PROBLEMS

Home canners striving for perfection in their packs are dismayed to find the fruit at the top of the jar—or the liquid half way down on the vegetables, while the loss from spoilage is often a serious matter.

Fruits that are soft, tender or juicy break down when heated and tend to float on top, or if too little fruit is packed in the jar it is apt to float in the sirup. Over-processing tends to affect the texture and cause fruits to float, while a syrup that is too heavy for the fruit will cause it to shrivel and float.

Improper packing or too short a pre-cooking period may account for loss of liquid—or there may be air-pockets left in the jar. The latter may be eliminated by using hot liquids and by inserting a thin spatula down the side of the jar.

Keeping the water over the tops of the jars in the water-bath helps to retain the liquid within.

The management of the pressure cooker entails keeping the pressure uniform throughout the cooking period, and allowing the pressure to go back to zero before removing the cover. Otherwise there is loss of liquid from the glass jars when the pressure is released.

Spoilage is another common problem on which commercial canners have done much studying. Elimination of delay in processing, after products are packed lessens danger of flat sour. Products should be processed immediately after pre-cooking. If there must be delay, keep them cool until ready. Selection of good equipment, including jars free from cracks, perfect covers, good quality jar rings, and suitable processing outfits will insure better results.

Over-packing of containers with little free liquid may result in insufficient processing, which is apt to cause spoilage. Allowing the water to boil off the tops of the jars, counting time too soon, and letting the temperature fall below the boiling point or the specified pressure results in under-processing.

Holding canned products in a warm storage place will hasten their deterioration.

FRUITS

Fruits may be canned by the water bath method, in the oven and with the pressure cooker using five pounds pressure.

They may be canned with or without sugar depending upon the use to which they are to be put.

All hard fruits and most of the soft fruits if intended for dessert should be canned with sugar syrup. This method conserves the color and quality, and provides fruit and syrup in best proportions for serving without any further treatment.

The density of the syrup to be used will depend upon the acidity of the fruit, the closeness of the pack and the taste of the consumer. If the pack is solid a heavier syrup must be used to secure a product of the desired sweetness.

When sugar is high-priced, fruits may be canned by substituting water or fruit juice for syrup.

Fruit for canning should be well ripened to be of best natural flavor, but not over-ripe, to secure the best appearance. Unripe fruit lacks color, flavor, and is of poor texture. Over-ripe fruits often are of inferior quality but may be used for jams and butter.

Discoloration is prevented by placing peeled or sliced fruit in a brine made by adding one tablespoon salt to one quart of water, or a light

SYRUPS

Type	Proportions	Method of Preparing
Thin syrup	1 cup sugar to 3 cups water	Heat sugar and water together until sugar is dissolved and syrup is boiling. Fruit juice may be used in place of water.
Medium syrup . .	1 cup sugar to 2 cups water	
Thick syrup . . .	1 cup sugar to 1 cup water	

sugar syrup, one-fourth cup sugar per quart. The syrup may be strained and concentrated to be used with the canning syrup.

Soft fruits should be washed just before packing. Small fruits must be packed carefully to avoid crushing and shaken down in the jar to secure a close pack. Large fruits must be arranged in the jar to secure an attractive and economical pack. A spatula or narrow wooden spoon will be helpful in arranging the pieces in the jar.

After the jar is packed, hot syrup is added to expel the air bubbles. Inserting a thin spatula will better insure driving out the air.

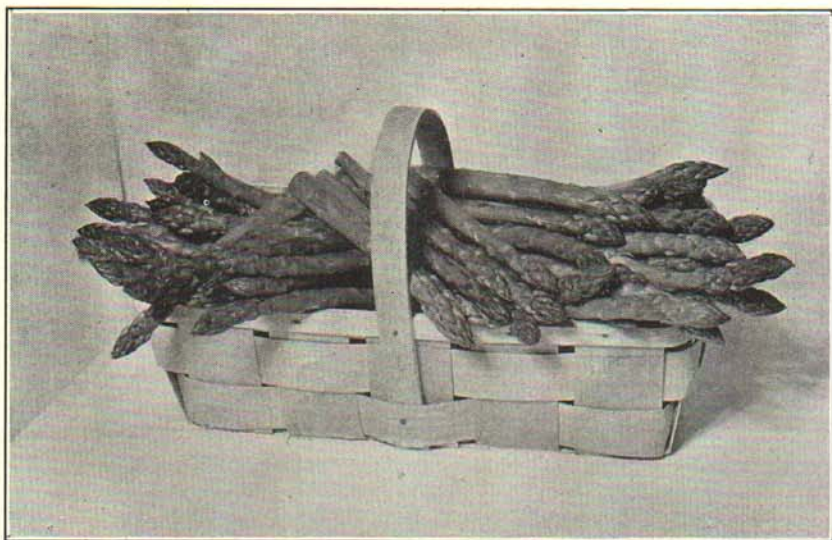


Fig. 6. One hour from the garden to the can is a safe rule for vegetables. Can only fresh, perfect vegetables.

PREPARATION OF VEGETABLES

Selection:

Since most vegetables deteriorate rapidly they should be canned as quickly as possible after harvesting. Fresh, properly matured vegetables, free from decay or bruises will produce the highest quality pack.

Grading:

Uniformity of size of product, and of degree of ripeness will add to the quality of the finished product. Peas may be graded through a coarse wire netting. Beets, carrots, and beans should be graded for size and color. Asparagus may be selected for size and the tougher portions cut fine for soup mixtures. Tough, mature over-ripe vegetables should be discarded. Portions showing mold or decay should be entirely cut away.

Washing:

Thorough washing through running water is necessary to insure products free from grit or soil contamination. If running water is not available vegetables should be washed through several changes of water. Root vegetables must be thoroughly scrubbed with a stiff vegetable brush. Greens may be placed in lukewarm water for a few minutes before washing to loosen the sand. In picking greens such as spinach, if the upper portion is picked and the remainder is left there is much less soil adhering.



Fig. 7. Serve Michigan tomatoes for your breakfast beverage.

Pre-cooking:

Preparation of vegetables as for the table, and cooking them for a very short period then packing into containers while hot, is the method now recommended for vegetable canning. Beets and tomatoes may be cold-dipped to make them easier to handle but experimental canning has shown that vegetables are more easily and completely processed if this step is omitted for other products. Pre-cooking or scalding reduces the bulk of vegetables such as greens, removes the objectionable flavors from some green vegetables, protects the color and makes products much easier to handle and pack. Vegetables contain air or other gases which are forced out in this pre-cooking process so that it is possible to secure a close, uniform pack. The pre-cooking period should be only long enough to thoroughly heat the product, not to cook it completely. Time tables suggested on page 21 are not arbitrary.

Vegetables should be pre-cooked in boiling water to cover—except that greens may be cooked in steam only long enough to shrink.

Packing:

Vegetables should be packed according to their texture. Those containing a large amount of fiber such as greens and corn should not be packed too tightly, nor should those that tend to swell, such as peas or lima beans. Products such as beets, carrots, string beans and asparagus may be packed more closely.

Jars should be filled to within one-half inch of the top then filled with the liquid in which the vegetables cooked, to that same level. If additional liquid is needed boiling water may be added. Tomatoes should have tomato juice added instead of water.

Salt in the proportion of one teaspoon to a quart jar should be added to the packed container. Water containing too much iron or lime may affect the color and texture of the product hence should not be used in canning.

Specific procedures are included in the time tables for vegetables commonly canned in Michigan.

Processing:

Following packing, the containers should be processed immediately. If time must elapse they should be cooled, then add liquid boiling hot immediately before processing, to lessen danger of flat sour.

Directions for processing by various methods are listed elsewhere.

MEATS

Meats are ready for canning as soon as the animal heat has disappeared. They may be cooked first, fried, broiled, roasted, baked or stewed. They should be seasoned but not cooked until done. Jars should be filled but not tightly packed. Pour over the pan gravy. There should be a half-inch space above meat and gravy. Add one teaspoon of salt, to each pint jar. Seal tin cans completely. Glass jars of the mason type should be sealed tight then turned back one-fourth turn. The second wire on the glass-top jars should not be adjusted until the jars are removed from the canner.

Place the jars in pressure cooker in which there is hot water up to the rack, but not over it.

In case the meat has been put in the tin cans cold, it is necessary to **exhaust** the air by placing them in boiling water to within one inch of the top for 5 to 8 minutes, then sealing quickly. This must also be done if the gravy has been allowed to cool. After exhausting and sealing, the jars should be processed for one hour at 15 pounds pressure. Leave petcock open for ten minutes then count time after the desired pressure has been reached. After the processing time is over, allow the pressure to go back to zero before opening the cooker. Quickly cool tin cans and place glass jars away from a draft after adjusting covers and testing for leaks. Plain tins may be used for meat.

TIME TABLE FOR PROCESSING MEATS

Product	Processing time			
	Boiling water 210°-212° *Not recommended by Bureau of Home Economics		Steam pressure 15 pounds	
	No. 2 tin or pint glass	No. 3 tin or quart glass	No. 2 tin or pint glass	No. 3 tin or quart glass
Meats— Beef, pork, veal, lamb— uncooked—cut into pieces for serving.	3 hrs.	3 hrs. 40 min.	1 hr.	70 min.
Roasts— Cooked and cut.	3 hrs.	3 hrs. 40 min.	1 hr.	70 min.
Fried— Steaks, chops, sausage, spare-ribs.	3 hrs.	3 hrs. 40 min.	1 hr.	70 min.
Soup with meat stock or vegetable soup mixture.	3 hrs.	3 hrs.	1 hr.	
Chicken.	3 hrs.	3½ hrs.	60 min.	70 min.
Fish.	3 hrs.	.....	60 min.	

*NOTE:—Boil all meats canned by methods other than the pressure cooker for 15 minutes before tasting.

Hot Water-Bath Method: In a study of meat canning conducted at the University of Iowa, beef and pork processed for three hours in the hot water-bath kept perfectly when canned in pint jars. Quarts should probably be allowed 40 minutes longer for the necessary heat penetration. **Fresh, clean, good quality meat should always be used.** These studies showed no particular difference in the keeping quality of meat canned with or without water, with or without extra fat. Freezing before canning did not affect the keeping qualities.

Variety in Preparation: Canned meats will be more popular if a variety of methods are used in preparing it.

The choice cuts should be canned in large pieces. Steaks may be cut thin, seasoned, rolled and tied, and packed in a quart jar. Roasts may be browned and packed.

Tough portions may be ground, seasoned, and made into meat patties. Brown these, pack into jars and pour over the pan gravy. Seal and

process. A similar jar may have chili sauce or catsup poured over it before sealing.

Vegetables cut fine or ground may be added to the soup made from bones and scraps which have been cooked in water for several hours then strained.

Special Suggestions:

1. Brown meats to conserve flavor, improve color, and retain flavor.
2. Although bones take up considerable space in the jars, they add flavor and aid in the heat distribution.
3. Do not fill the jars too full, otherwise there is no room for expansion. Add pan gravy or a small amount of water.
4. Keep the pressure constant in the pressure cooker.
5. Packing hot foods in jars reduces pressure within and permits complete sealing early in the cooking process, and less loss of liquid from the jar.
6. Protect glass jars from danger of breakage by keeping away from cold drafts or cold water. Placing a cold jar in hot water should be done quickly, otherwise unequal expansion will cause cracking.
7. Jars do not need to be filled with liquid in order to keep. The meat juices will usually nearly fill the jar when canned.

Canning Chicken

Chicken canning is economical since it utilizes the surplus without waste of feed. Flavor is conserved, and tough meat is made tender by canning process.

Preparation:

1. After chicken is properly killed, picked, and cooled, singe and wash well.
2. Cut off feet, legs, thighs and wings.
3. Cut skin from wing opening toward head.
4. Loosen wind pipe, crop, gullet.
5. Remove shoulder blades by cutting across back and underneath, then breaking off at joint.
6. Cut along cartilages on ribs carefully and continue to pelvic bone, then cut carefully around vent.
7. Loosen entrails and remove in one mass.
8. Separate carcass on other side.
9. Cut white meat from breast bone.
10. Remove wishbone and flesh adhering to it.
11. Remove gizzard, heart, and liver carefully. Remove sack from gizzard by cutting carefully through thick portion. Do not break gall bladder in removing liver. **Giblets should be packed in a separate jar.**

Packing: Pack in clean hot jars in this order: Thigh, drumstick, two wings, neck and ribs in center of jar for support, covered with back. Place white meat over back covering it entirely. Add remaining pieces except giblets. Add two teaspoons salt but no liquid. If in glass, place rubber jar ring and partially seal; in tin, exhaust by placing in boiling water for seven minutes, then seal completely.

Processing: Place in pressure cooker, leave petcock open for ten minutes after steam begins to escape then close. Process for one hour at fifteen pounds pressure. Tin cans may be cooled in cold water.

Canning Rabbit

The method of canning chicken suggested may also be used for rabbit. The pieces may be fried before packing if desired.

References

- U. S. D. A. Farmers' Bulletin No. 1471.
- Food Preservation—Chenoweth.
- Successful Canning and Preservation—Malcolm.

TIME TABLE FOR CANNING FRUITS AND ACID VEGETABLES

Product	Method of treatment before processing	Processing period in boiling water		Processing in heat-controlled oven at 275°
		Pint and quart glass jars	No. 2 and No. 3 tin cans	
Apples.....	Wash—slice, quarter or halve, place in salt bath to prevent discoloring, then pack in containers and cover with boiling syrup.....	15 min.	10 min. Plain tin	Pint and quart glass jars
	Or boil whole in syrup, or bake as for serving, cover with syrup and pack hot.....	5 min.	5 min.	20 min.
	Or pack hot in form of apple sauce.....	5 min.	5 min.	20 min.
Blackberries Blueberries Dewberries Gooseberries Huckleberries Raspberries	Sort carefully, wash a shallow layer in colander or strainer. Pack in containers. Fill with boiling hot medium syrup. Berry juice may be used instead of water in making the syrup.....	20 min.	15 min. 5 min.	35 min.
	Or precook and pack hot.....	5 min.	Sanitary enamel	20 min.
Cherries.....	Wash and remove pits or can with pits if desired. Pack in containers. Fill with boiling hot syrup using thick syrup for sour cherries and medium syrup for sweet.....	25 min.	20 min.	30 min.
	Or remove pits, add sugar as desired, bring to boil and pack.....	5 min.	5 min. Sanitary enamel	20 min.

TIME TABLE FOR CANNING FRUITS AND ACID VEGETABLES—Continued

Product	Method of treatment before processing	Processing period in boiling water		Processing in heat-controlled oven at 275°
		Pint and quart glass jars	No. 2 and No. 3 tin cans	
Currants.....	Same as berries.			Pint and quart glass jars
Peaches.....	Scald, dip into cold water, and peel. Cut in half, remove pit and pack into containers. Add heavy or medium syrup in which one cracked pit for every quart of syrup has been boiled.....	20 min.	15 min. Plain tin	35 min.
Pears.....	To prevent discoloration place in cold salt bath after peeling. Use 1 tablespoon salt to 1 qt. water. Cook for four to eight minutes in boiling medium syrup. Pack in containers, fill with boiling syrup.	20 min.	20 min. Plain tin	35 min.
Pineapples.....	Slice, peel, cover and cut in desired size pieces. Pack in containers. Fill with boiling thin syrup.....	30 min.	25 min. Plain tin	45 min.
Plums.....	Wash—prick skins, fill containers. Cover with boiling medium syrup..... Or bring to boil using sugar as desired.....	20 min. 5 min.	15 min. 5 min. Sanitary enamel	45 min. 20 min.

Rhubarb.....	Wash—cut in half inch lengths. Add one-fourth as much sugar as rhubarb by measure. Bake until tender in a covered baking dish. Pack in hot containers.....	5 min.	5 min.	20 min.
	Or pack uncooked with boiling syrup—medium.....	20 min.	15 min. Sanitary enamel	30 min.
Strawberries...	To each quart add one cup of sugar and two table- spoons of water. Boil slowly for 15 minutes. Let stand over night in the kettle. Reheat to boiling. Fill containers hot.....	5 min.	5 min.	20 min.
	Or pack raw and cover with boiling syrup.....	20 min.	15 min. Sanitary enamel	35 min.
Tomatoes.....	Wash, scald, and peel. Pack whole or cut in pieces. Cover with hot tomato juice. Add one teaspoon salt to each quart.....	45 min.	35 min. Sanitary enamel or plain tin	50 min.
Tomato juice...	Select firm ripe tomatoes. Wash well and drain. Cut into sections. Add a small quantity of water. Start cooking and simmer until softened. Stir occasionally to prevent burning. Put through sieve fine enough to remove seeds. Bring juice to boiling point, and add one teaspoon salt to each quart. Fill immediately into hot containers.....	5 min.	5 min. Sanitary enamel or plain tin	20 min.
Grape juice....	Stem, wash, and crush ripe grapes. Cook over slow fire until soft. Strain through cheese-cloth bag without squeezing. Measure juice; bring to boil- ing point. Add one-half cup sugar to each quart and bring to boil. Fill into hot jars.....	5 min.	5 min. Sanitary enamel	20 min.

Time tables adapted from U. S. D. A. Farmers Bulletin No. 1471.

TIME TABLE FOR CANNING NON-ACID VEGETABLES*

Product	Method of treatment	Processing period in pressure cooker			† Processing period boiling water bath	
		Quart glass jars	Pint glass jars	No. 2 and No. 3 tin cans	Quart glass jars and No. 3 tin cans	Pint glass jars and No. 2 tin cans
Asparagus . .	Grade according to size, wash thoroughly, cut stalks in suitable length for packing, tie in bundles. Place in sauce pan with boiling water over lower tough portion, boil 2 or 3 min., pack hot into containers with tips up. Add 1 teaspoon salt per quart—cover with water in which it boiled and process immediately. Or cut in ½ inch lengths, bring to boil in water to cover, and pack hot into containers.	40 min. at 10 lbs. pressure or 240°F.	35 min. at 10 lbs. pressure or 240°F.	30 min. at 10 lbs. in plain tin	3 hrs.	2 hrs. 50 min.
Beans, string	Pods should be young and tender and free from strings. Wash, cut off stem and blossom end. Leave pods whole or cut in inch lengths. Boil 2 to 3 minutes with water to cover. Add 1 teaspoon salt per quart. Pack hot into containers and process immediately.	40 min. at 10 lbs. pressure or 240°F.	35 min. at 10 lbs. pressure or 240°F.	30 min. at 10 lbs. in plain tin or C enamel	3 hrs.	2 hrs. 50 min.
Beans, Lima.	Can only young and tender beans. Shell soon after picking. Grade—boil 3 to 5 minutes. Add 1 teaspoon salt per quart. Pack hot and process immediately.	60 min. at 10 lbs. pressure or 240°F.	55 min. at 10 lbs. pressure or 240°F.	55 min. at 10 lbs. C enamel	3 hrs.	2 hrs. 50 min.

Beets.....	Can only young tender beets. Scrub, grade—boil until skins slip, leaving on one inch of tops to prevent bleeding. Peel, pack hot into containers, fill with boiling water, add 1 teaspoon salt per quart.	40 min. at 10 lbs. pressure or 240°F.	35 min. at 10 lbs. pressure	30 min. at 10 lbs. Sanitary enamel	2 hrs.	1 hr. 50 min.
Carrots.....	Can only young tender carrots, and only if other methods of storage are not available. Scrub—boil 10 minutes. Skin—cut or pack whole—add 1 teaspoon salt per quart and boiling water.	40 min. at 10 lbs. pressure or 240°F.	35 min. at 10 lbs. pressure	30 min. at 10 lbs. pressure Plain tin	2 hrs.	1 hr. 50 min.
Cauliflower.	Soak in cold salt water to remove insects. Separate flowerets. Boil 3 minutes. Pack, add water in which it was cooked and 1 teaspoon salt per quart. Process at once.	40 min. at 10 lbs. pressure or 240°F.	35 min. at 10 lbs. pressure	30 min. at 10 lbs. pressure Plain tin	2 hrs.	1 hr. 50 min.
Corn.....	Remove husks and silk carefully using a clean brush. Cut from cob, cutting from tip. Add half as much boiling water by weight, and 1 teaspoon salt per quart, heat to boiling, pack hot into containers.	90 min. at 15 lbs. pressure or 250°F.	85 min. at 15 lbs. pressure	80 min. at 15 lbs. C enamel No. 2 only	3 hrs.	2 hrs. 50 min.
Greens: Beet tops Chard Spinach	Wash thoroughly in running water or lift from several waters. Remove wilted or bruised leaves. Steam or heat in a covered utensil until wilted using just enough water to prevent burning. Pack hot into containers. Add 1 teaspoon salt per quart. Avoid packing too closely, then cut through contents of jar with knife to loosen. See that there is liquid to cover.	65 min. at 10 lbs. pressure or 240°F.	60 min. at 10 lbs. pressure	55 min. at 10 lbs. pressure Plain tin No. 2 only	3 hrs.	2 hrs. 50 min.

*Time tables adapted from U. S. D. A. Farmers Bulletin No. 1471.

TIME TABLE FOR CANNING NON-ACID VEGETABLES—Continued

Product	Method of treatment	Processing period in pressure cooker			Processing period boiling water bath	
		Quart glass jars	Pint glass jars	No. 2 and No. 3 tin cans	Quart glass jars and No. 3 tin cans	Pint glass jars and No. 2 tin cans
Mushrooms.	Peel, drop into water containing one tablespoon of vinegar per quart. Pre-cook by immersing three to four minutes in boiling water which contains one tablespoon vinegar and one teaspoon salt per quart. Fill into containers at once and cover with freshly boiling water. The tiny buttons do not require peeling.	35 min. at 10 lbs. pressure or 240°F.	25 min. at 10 lbs. pressure or 240°F.	25 min. at 10 lbs. pressure Plain tin	3 hrs.	2 hrs. 50 min.
Peas, green.	Can only young tender peas. Bring to boil with water to cover and pack hot into containers. Add 1 teaspoon salt per quart.	55 min. at 10 lbs. pressure or 240°F.	45 min. at 10 lbs. pressure or 240°F.	45 min. at 10 lbs. pressure C enamel	3 hrs.	2 hrs. 50 min.
Pumpkin, Squash	Cut into cubes. Add small quantity of water, bring to boil. Stir while heating through. Pack into hot containers.	75 min. at 15 lbs. pressure or 250°F.	60 min. at 15 lbs. pressure or 250°F.	60 min. No. 2 70 min. No. 3 at 15 lbs. pressure or 250° Sanitary enamel	3 hrs.	2 hrs. 50 min.

†Note: Boil all non-acid vegetables canned by methods other than the pressure cooker for 15 minutes before tasting.

