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EC9965 Food Preservation by Freezing

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Food Preservation by **FREEZING**



1944 ?

University of Nebraska Agricultural College
Extension Service. Extension Circular 9965

Food Preservation by Freezing

Mabel Doremus

Quick freezing, when properly done, preserves foods so that the color, flavor, texture, and nutritional values of many fresh products are more nearly retained than by any other preserving method.

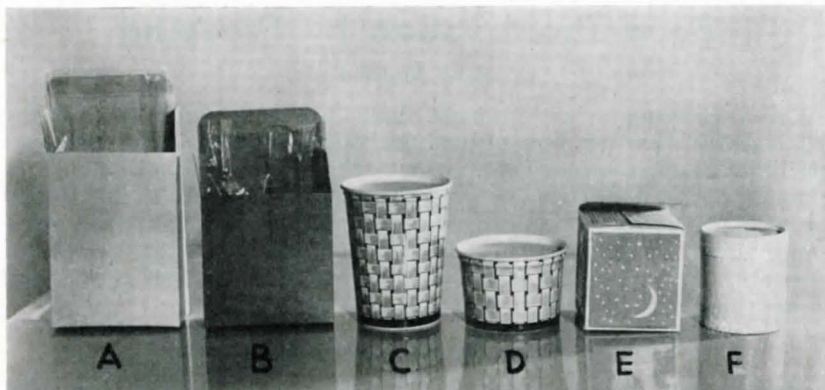
In preparing foods for freezing, cleanliness, attention to detail, and speed, particularly in handling vegetables and meats, cannot be over-emphasized. Special care must be taken to obtain proper varieties of vegetables and fruits for freezing, to gather them at their prime, and to get them into the locker promptly.

Temperatures for Freezing and Storage

Results from research carried on at various institutions show that the most satisfactory frozen foods are obtained when the products are frozen rapidly. A sharp-freeze room or cabinet is desirable for storage lockers, and a temperature of -10° to -20° F. or lower should be used for freezing. Average-size packages should remain in the sharp freezer for 14 to 48 hours, depending on the kind of sharp freezer, size of package, and the nature of the product. If a sharp freezer is not available, arrange to keep food items separated or scattered until frozen. Use a fan to keep the air in motion.



Meat, vegetables, and fruits maintain their quality when frozen quickly in a sharp freeze room at temperatures of 10° to 20° below zero.



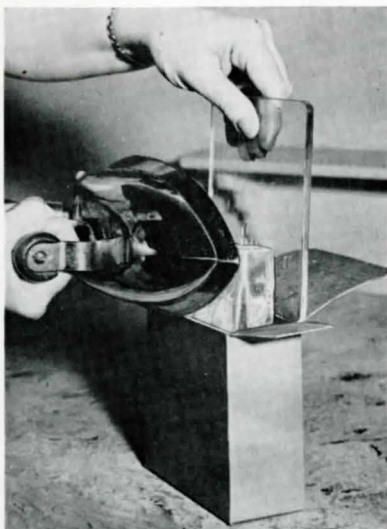
Several cartons and containers are on the market, and new ones are being offered each season. A and B are serviceable cartons with cellophane bags inside which are sealed after filling. C and D are waxed fruit cups most commonly used for berries. E is a waxed square carton which can be sealed with a hot iron. F is a lightly waxed carton with vertical sides which can be used for fruit or vegetables. A, B, and E are preferred for vegetables; C, D, E, and F for fruits, and for vegetables that might leak some liquid while being prepared for freezing.

It is now recommended that the storage locker room be maintained at 0° F. and never higher than 5° F. Flavor and quality are impaired if temperatures are allowed to fluctuate. When food is first frozen in a sharp freezing room or cabinet, solid wall lockers or non-ventilated lockers reduce air circulation and result in less shrinkage and dehydration during the storage period.

Wrapping Materials and Containers for Frozen Products

To keep frozen food similar in quality to fresh food, it is necessary to keep the moisture in and the air out. Wrapping materials and containers should be selected with these principles in mind. Moisture-vapor-proof paper is generally used for wrapping meat and poultry.

Containers should be of a size that best meets the needs of the family. Usually average-size containers (pints or quarts) are best for quick freezing. Square or rectangular containers save much space in the locker.

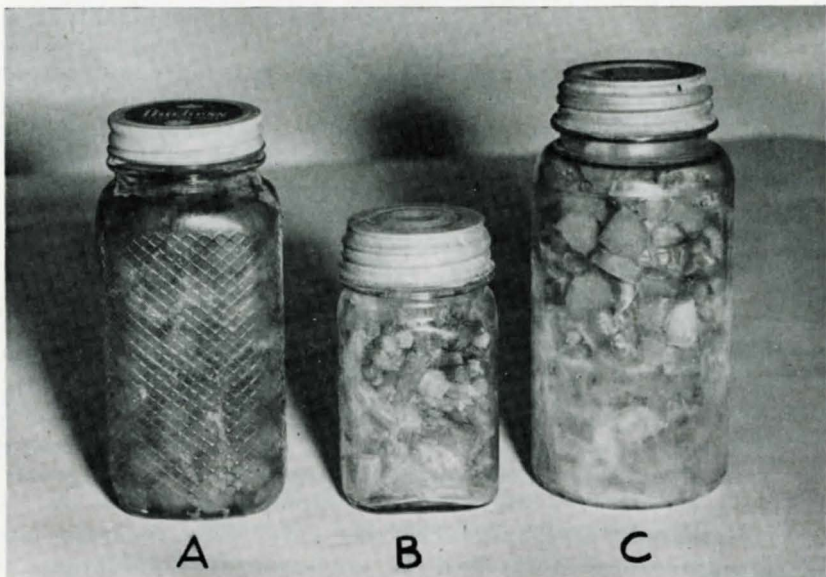


When cartons and cellophane bags are used, fill the bag in the carton, then seal the top of the bag with a hot iron. In this illustration, a piece of windshield glass is being used to press against in sealing the bag. Several cartons can be sealed per minute in this manner, and without handling the cartons.

When cartons and cellophane bags are used, fill the bag in the carton, then seal the top of the bag with a hot iron. In this illustration, a piece of windshield glass is being used to press against in sealing the bag. Several cartons can be sealed per minute in this manner, and without handling the cartons.

The containers found most satisfactory for fruits and vegetables are heavily paraffined paper-board cartons. Paraffined folding cartons with water proof cellophane or paraffined lining bags prove very successful as containers for many frozen products. The liners are sealed with a hot iron.

Glass jars may be used. An air-tight container is desirable and a glass jar sealed with a rubber fulfills that requirement. Precaution



Glass jars make air-tight containers but are easily broken and do not make economical use of locker space. A—Cherries, B—Asparagus, C—Rhubarb.

needs to be taken, however, not to fill the jars more than nine-tenths full to allow room for expansion of the product in freezing. Products need to be almost completely thawed before they can be removed from the jars. Glass jars must be piled and handled carefully in lockers to prevent breakage.

Tin containers may be used if they are air-tight. They may be sealed with a hand sealer or provided with suitable friction-top covers. Lacquered tins are necessary for most fruits and vegetables, particularly those fruits with high acid content, those which discolor badly, such as red fruits and beets, and vegetables packed in weak brine solutions. About one-half inch space should be allowed in tin and paper containers to provide for expansion.

Preparation and Freezing of Fruit

These varieties of fruits which are grown in Nebraska are recommended for freezing:

- (1) **Cherries**—Montmorency, Early Richmond, English Morello; (2)

Strawberries—Senator Dunlap, Blakemore, Premier, Gem, Wayseta, (everbearing); (3) **Plums**—Dawson, Omaha, Wauneta; (4) **Gooseberries**—Carrie, Downing, Champion; (5) **Peaches**—Elberta, Champion, Hale Haven, Rochester; (6) **Apricots**—Blenheim, Moorpark; (7) **Rhubarb**—Ruby, McDonald, Linnaeus; (8) **Red Raspberries**—Latham, Chief; (9) **Black Raspberries**—Cumberland; (10) **Purple Cane Raspberries**—Cardinal, Sodus.

Grapes and pears are not suited for freezing.

A high quality frozen fruit can result only from a high quality fresh fruit. Select fully ripe, sound fruits. The use of unripe fruit results in undesirable texture, flavor, aroma, or color. It is likely to taste sour and somewhat bitter. Fruits for freezing are prepared in the same manner as for table use or canning. Strict cleanliness in handling will help reduce the number of bacteria and assure a frozen product of good quality.

Sirup Pack.—Larger fruits such as peaches, apricots and plums, may be sliced and covered with a cold heavy sirup. The sirup helps preserve the color. Strawberries and raspberries may also be frozen in the sirup. Use the least possible amount of sirup to cover the fruit.

A 40 to 60 per cent sirup may be used. A 40 to 45 per cent sirup is best suited to sweet and mild-flavored fruits while a 50 per cent sirup may be used for sour acid fruits. With limited amounts of sugar available, the thinner sirups may be used. Formulas for 40, 50, and 60 per cent sirup:

40% sirup— $\frac{2}{3}$ cups sugar to 1 cup water

50% sirup—1 cup sugar to 1 cup water

60% sirup— $1\frac{1}{2}$ cups sugar to 1 cup water

Stir until the sugar is dissolved. Do not heat or cook the sirup.

If desired, honey may be substituted for sugar sirup as a packing liquid. It should be made into a rather light sirup, using about an equal amount of water for thinning. Honey and sugar may be combined in a sirup in the proportion of one part honey and one and one-half parts of sugar and two parts of water. Corn sirup may be used successfully by making it into a light sirup, using about an equal amount of water for thinning.

Dry-Sugar Pack.—One method extensively used is to combine the whole or sliced fruit with dry sugar. The sugar draws out the fruit juice, forming a sirup without the addition of water. Strawberries, raspberries, cherries and other small fruit may be packed this way. The proportion is usually one pound of sugar to three or four pounds of fruit. Distribute the sugar evenly throughout the product so that it dissolves quickly. This gives a less tender product than the sirup method but less watery.

When fruit is covered with a sugar sirup or when dry sugar is put in to form a sirup from the juice of the fruit, less air comes in contact with the fruit. This is desirable because oxidation of fruits by air results in discoloration and unpleasant changes in flavor.

Dry Pack Without Sugar.—Some fruits have been successfully frozen without the addition of sugar or liquid. Fruits which may be handled in this way are certain varieties of raspberries, strawberries, and rhubarb. Most dry-packed fruits are more suitable for making pies, marmalades and other cooked products than they are for dessert use, since they have a tendency to be somewhat flabby when defrosted.

Fruit Juices and Fruit Pulps

Fruit juice and tomato juice may be frozen, but for most juices this process is not sufficiently perfected to give a product equivalent to fresh juices. (Exceptions are cider, cherry juice, grape, and most berry juices.)

Pulps and purees, which may be made from fruits with bright colors and pronounced flavors, make delicious flavor bases for ice creams and other frozen desserts and toppings for sundaes and shortcakes.

Freezing of Vegetables

Vegetables which are to be frozen should be harvested when in prime condition. The product should be graded for uniformity in maturity and size, thoroughly cleaned, and prepared as for cooking. It is well to freeze only those types of vegetables in which freshness is the principal factor of quality, those which lose color or flavor in canning, those which are not bulky, and those which do not keep well by other food storage methods. The shorter the time between harvesting and the time the product is properly prepared and placed in the sharp freezer, the better the product.

Some vegetables which when frozen taste like fresh vegetables are: peas, young lima beans, asparagus, sweet corn off the cob, broccoli, spinach, and kale. Experiments have shown that certain varieties of vegetables are better adapted to freezing than others. Some varieties of vegetables grown in Nebraska, found to be good for freezing are:

(1) **Asparagus**—Washington varieties; (2) **Snap Beans**—Giant Stringless Green Pod, Stringless Green Pod, Kentucky Wonder, Tendergreen, Black Valentine, Round Pod Kidney Wax; (3) **Lima Beans**—Henderson Bush, Baby Potato, Hopi; (5) **Broccoli**—Italian Green Sprouting; (6) **Peas**—Little Marvel, Laxton Progress, Hundredfold, Blue Bantam; (7) **Spinach**—Bloomsdale Savoy, Bloomsdale Long Standing, Giant Nobel, New Zealand; (8) **Sweet Corn**—Golden Cross Bantam, Golden Bantam, Tendergold, Narrow Grain Evergreen; (white varieties are less attractive in color when frozen. Corn frozen on the cob is likely to taste of the cob, and is too bulky for economical use of locker space.)

Vegetables to be frozen must be scalded immediately after preparation in order to destroy enzymes which might result in undesirable flavor. Scald not over a pound of vegetable per gallon of boiling water. A wire basket or a cheesecloth sack may be used for immersing the vegetables in the boiling water. The water should reach the boiling

point again $\frac{1}{2}$ minute after the vegetable has been immersed into it. Cool the vegetable quickly to at least 60° F. in running cold water, drain well and pack. Quick freeze at once.

Steps in the Preparation of Vegetables for Freezing

Vegetable	Form in Which Frozen	Treatment before Freezing	Care after Scalding
Asparagus	Young, green tips.	Wash, scald $3\frac{1}{2}$ minutes.	Cool in cold running water, pack in air-tight containers. Quick freeze.
Beans: Snap	Small, fresh, tender.	Clean, wash, cut into desired lengths, scald 2 minutes.	Cool in cold running water, pack in air-tight containers. Quick freeze. Store at very low temperature.
Beans: Lima	Green beans best.	Shell, wash, scald 1 to 2 minutes, depending on size.	Cool promptly. Pack in air-tight containers. Quick freeze.
Beans: Soy	Young and fresh.	Scald pods, shell and scald beans 2 minutes.	Cool in cold running water, pack in air-tight containers. Quick freeze.
Broccoli	Compact heads	Cut head into one inch thick pieces. Wash, scald 3 to 5 minutes.	Cool in cold running water. Pack in air-tight containers. Quick freeze.
Peas	Young, fresh	Wash, scald small peas 45 seconds, large peas 1 minute.	Cool in cold running water. Pack in air-tight containers. Quick freeze.
Spinach	Young, fresh	Wash in running water eliminating all sand and earth. Discard thick stems, scald small amount at a time, for $2\frac{1}{2}$ minutes.	Cool immediately in cold running water. Drain and pack in moisture-vapor-proof containers. Quick freeze.
Sweet corn, on the cob	Fresh, young, tender.	Husk, sort and scald $6\frac{1}{2}$ to $10\frac{1}{2}$ minutes, depending upon the size of ears and maturity of kernels.	Cool immediately, in very cold running water. Wrap individual ears in moisture-proof paper and quick freeze.
Sweet corn, whole kernel	Fresh, young, tender.	Scald ears 2 or 3 minutes. Cool. Cut from cob.	Pack dry in moisture-vapor proof containers and quick freeze.

Brine Pack.—Commercially packed vegetables are packed without liquid and this is recommended for home use. A few people prefer to pack vegetables in a two per cent salt solution which later can serve as part of the cooking water. This brine solution is prepared by adding one teaspoon of salt to one cup of water, and should be cold when added to the product.



Peas or other similar vegetables may be scalded in this manner. Use a large deep kettle and about four quarts of boiling water. Scald not over a pound of vegetable at a time, using the same boiling water again and again.

Sweet corn can be scalded in this manner. Use a large deep kettle about two-thirds full of boiling water. Dip from six to twelve ears at a time, depending upon how much help is available to cool, cut, and package the corn quickly.

Preservation of Meat by Freezing

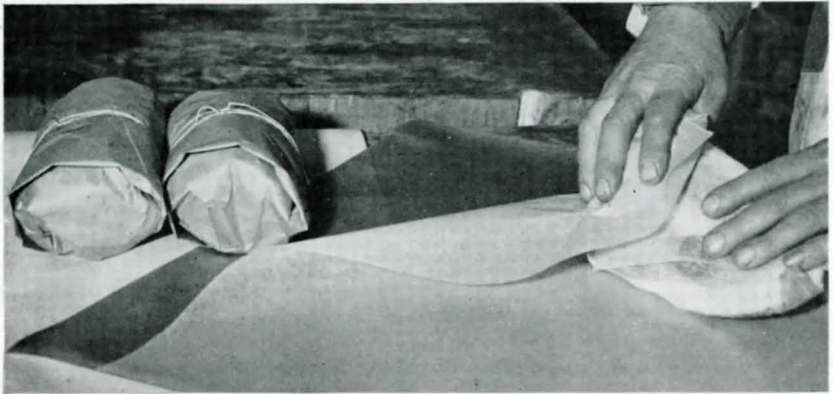
Beef, lamb, and pork can be stored in a freezer locker for some time. Healthy, well-conditioned animals furnish the best meat. A good covering of fat protects the lean meat from drying while frozen and is more tender and juicy than plainer meat. Fresh pork is more perishable than beef or lamb and ordinarily should not be kept more than 6 to 8 months in the locker. Beef, lamb, and lightly cured pork may be kept a year or more if properly prepared and stored in a good locker.

In handling meats, insure cleanliness by having clean hands, utensils, clothing, and equipment. Beef and lamb may be aged to develop flavor and tenderness but recent experiments indicate that the longer they are aged the sooner they become rancid in the frozen food lockers. The temperature of the aging room should be around 36° F. Pork is not aged but packaged and frozen as soon as thoroughly chilled (36 to 48 hours).

To conserve locker space, trim the cuts to convenient shapes, removing as much bone as possible.

The size of the individual meat package will depend on the size of the family and the refrigeration facilities at home. When a number of cuts are placed in the same package, each cut should be separated from the others by a layer of waterproof paper. If this is done, then individual cuts may be separated without thawing. Ground meat may be packaged in wax paper cartons. Sausage is usually frozen without salt or spices and seasoned just before using.

In order that meat be palatable after being kept several months in a frozen food locker, proper packaging and wrapping materials are most important. Meat should be packaged in a moisture-vapor-proof paper. After the package is wrapped, it is tied carefully or sealed with special tape, and the contents of the package and date indicated. The wrapped meat is then spread out in the sharp freezer for freezing. It is important for the meat to be frozen before it is packed in the lockers. If piled in the locker, freezing will be delayed and there is more danger of spoilage and off flavors.



Tough, waxed paper is used to wrap meat. In this picture, note how the meat is being wrapped tightly with the inner waxed sheet of a special double freezer locker paper. The outer brown sheet is then wrapped around the package and tied. Name of the cut of meat and date can be written on this outside cover.

Preservation of Poultry by Freezing

Spring chickens in their prime may be made available the year around by freezer storage. When the poultry flock is to be reduced for any reason, the surplus chickens may be frozen to good advantage. To improve flavor and quality, poultry should be well fattened before slaughter.

To prepare poultry for freezing, thoroughly clean and prepare the bird as for table use. Poultry may be stored either whole or cut up. Some prefer to cut up the chickens in order to wrap pieces of one kind—legs, breasts, giblets, etc.—in separate packages.

Poultry may be glazed to prevent drying out. This service is offered at some locker plants and can be done only at the plant. The poultry is frozen, then dipped quickly into cold water. The zero temperature of the fowl causes a thin coating of ice to form over it immediately that seals and protects it. Wrap and store in the locker.

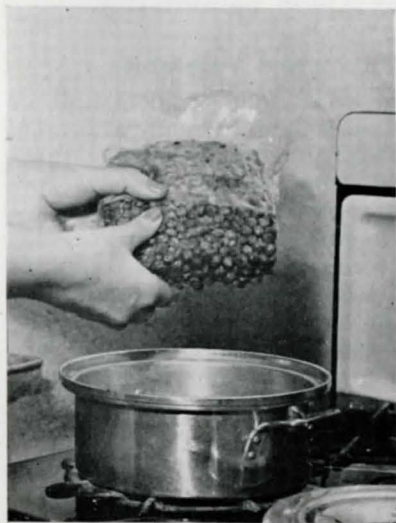
Chicken may be wrapped in the same kind of moisture-proof paper used for meats, or in cellophane moisture-proof bags. The poultry may be sealed in the bag by pressing the folded edges with a hot iron. Sometimes broilers and frying chickens are wrapped and frozen in large, friction-top tin cans.

Preservation of Fish by Freezing

All fish to be frozen should be placed on ice or in a refrigerator as soon as possible after catching and never be allowed to become warm. Before freezing, they should be cleaned and ready for cooking. If clean fish are immersed in 10 per cent salt solution for 20 to 30 seconds, the leakage or "weep" is reduced when the fish is thawed. They are then frozen as described for meat. Fish may be glazed after freezing to prevent drying out. (See directions for glazing poultry.)

Preparing Frozen Foods for the Table

Refrigeration is desirable for frozen foods when they are removed from the locker. They may be kept for several days in the freezing compartment of a mechanical refrigerator. They will defrost slowly in an ice refrigerator but should not be left for longer than 12 hours after they are completely thawed. If it is desired to keep them longer cook and then reheat just before serving.



This package of frozen peas is going directly out of the cellophane bag into the pan on the stove.

Cooking Frozen Vegetables

Frozen vegetables need not be thawed before cooking. If they are partially defrosted, however, the large frozen pieces may be broken up easily when the vegetables are put on to cook. The cooking process is similar to the method used for fresh vegetables. Use a small amount of water, and begin to count the time when the water boils again. Cook approximately for one-half to two-thirds of the time required for cooking fresh vegetables. Leave the cover on until the vegetables begin to boil, then raise the lid for venting, replace the lid, lower the heat, and cook until the vegetable is done.

Corn-on-the-cob is an exception to the rule that vegetables do not require thawing. If it is not thawed before cooking the kernels will be over-cooked before the center of the cob is hot.

Serving Frozen Fruit

Frozen fruits are similar to fresh unfrozen fruits that have stood in sugar. When served like fresh fruit they are most palatable if served while still containing a few ice crystals. Experimenting to determine the time required to defrost the fruit to just the correct point is well worth the effort.

Cooking Frozen Meats

It is not necessary to thaw meat before cooking. There is no difference in the flavor. There is less leakage after thawing if this is done in the refrigerator for a day or two. Do not thaw in water as this draws out the meat juices. Cook as soon as possible after thawing. Frozen meat, after thawing, spoils more readily than fresh meat not frozen.

If meat is not thawed, extra time will be needed for cooking. Experiments have shown that the shape of a roast influences the cooking time. A boned rib roast requires approximately 20 minutes more per pound when cooked without thawing (35 minutes when thawed and 55 minutes when not thawed). A roast without bones requires a longer cooking time than one with bones, approximately 10 to 20 minutes longer per pound, depending on the shape of the roast. A meat thermometer is useful for accuracy in roasting. To use it, make a hole in the meat with a skewer. Insert the thermometer in the largest or thickest part of the meat to the center. Ordinarily, frozen steaks and chops are cooked approximately twice as long as fresh, unfrozen ones.

Vitamin Values of Frozen Fruits and Vegetables

Recent studies on vitamin values of frozen food products indicate that frozen fruits lose little of their vitamin B and vitamin C content during freezing or freezer storage if kept at very low temperatures. Frozen fruits, eaten as soon as taken from storage, contain more vitamins than canned fruits. Frozen vegetables stored at very low temperatures retain Vitamin A and Vitamin B. The Vitamin C value of frozen vegetables is conserved by freezing but may be decreased between the harvesting and freezing and during the scalding and cooling in preparation for freezing if these processes are not carefully safeguarded. When frozen vegetables are cooked, Vitamin C values may be conserved if a small amount of water is used, if the vegetables are not over-cooked, and if the water is served with the vegetable or in some other form.