

frozen fruits AND Vegetables

for Home use



This archival publication may not reflect current scientific knowledge or recommendations.
Current information available from University of Minnesota Extension: <http://www.extension.umn.edu>

BY

D. Winter
L. Noble

Frozen Fruits and Vegetables for Home Use¹

WHEN properly prepared and handled, many frozen-pack fruits and vegetables closely resemble the fresh product in color, flavor, and cooking quality. Not all fruits and vegetables can be recommended for locker-storage use. Some do not freeze well, and others are too bulky to justify rental charges for storage.

The recommendations are not intended to apply to frozen-pack storage for commercial or industrial purposes, as the requirements for such uses are different in certain respects from those for the preservation of home-grown products in a refrigerated locker. When the frozen product is to be offered for sale it is necessary to determine the size of container and type of pack that is most acceptable to the trade. These requirements differ widely according to the utilization of the product and the method of distribution. Labeling requirements also must be considered. Further information about the freezing of fruits and vegetables for commercial or industrial purposes may be obtained by writing to the Division of Horticulture at University Farm, St. Paul.

STORAGE COSTS

Expenditures for freezing, rent, and containers will determine the total storage cost. Rental costs depend on

charge for locker, the number of containers it will hold, and the turnover in products stored. Assuming that the fruits and vegetables might be stored in an extra locker which could be rented for \$1 a month (the usual rate in Minnesota), the rental for six months would be \$6.

The type of containers used partly determines the number that the locker will hold. A locker with inside dimensions of 17 x 20 x 30 inches will hold approximately 90 one-quart cylindrical paperboard containers, making the rent for six months 6.66 cents per quart. The same locker would hold only about 70 one-quart glass jars at a rent of 8.57 cents each. A locker of the same size holds about 130 quarts packed in rectangular cartons at a rental cost of 4.61 cents per quart for six months. These figures apply when the locker is completely filled once during the six months and no additional products are put in. With more frequent turnover of products, the rent per quart would be reduced.

Cylindrical paperboard containers cost about three cents per pint or four cents per quart. Rectangular cartons cost about three cents for a two pound size holding about one and one-third quarts, and are available in a number of different sizes. Glass jars make good containers for freezing storage, but they are expensive to use. For example, the rental cost for six months in glass jars (not including cost of the

¹ Completion of certain parts of this project was made possible by workers on Official Project No. 65-1-71-140, Minnesota Work Projects Administration. Sponsor: University of Minnesota.

jars) is about 8.57 cents per quart as compared to about 6.86 cents per quart for six months when two-pound rectangular containers are purchased and the rental cost is added.

The usual charge for freezing is about two cents a quart. Thus, the total cost for freezing, rent, and containers will amount to about $7\frac{1}{2}$ to $12\frac{1}{2}$ cents per quart for an average storage period of four months or about 9 to $14\frac{1}{2}$ cents per quart for an average storage period of 6 months, according to the type and size of container used. A quart container will hold about twice the amount of canned product usually packed in a 20 ounce can.

FRUITS SUITABLE FOR FREEZING

Among the fruits commonly grown in Minnesota, strawberries, raspberries, and blueberries are best adapted for freezing in a refrigerated locker. Red and purple raspberries are preferable to black raspberries which are "seedy." Frozen-pack raspberries and blueberries are considered equal in quality to the fresh product, but strawberries soften somewhat on thawing. Berries from the last pickings should not be used as they are likely to be inferior in color, quality, and attractiveness when frozen. Red raspberries picked during extremely hot weather or after heavy rains will make a less desirable product than when picked during more favorable weather conditions.

Sometimes strawberries are sliced before they are packed. This procedure is likely to result in a product of very inferior appearance if berries with light inside color are used.

Most varieties of the sour cherry may be frozen satisfactorily if pitted and packed in sugar sirup (50%), un-

less they are to be used for pies for which purpose a dry sugar pack is preferred. Most varieties of plums and cherry-plums do not make a good frozen product for dessert use, although suitable varieties of the frozen product are very good when cooked.

Grapes may be frozen for cooking purposes without the addition of sugar or sugar sirup. Peaches should be scalded for about 30 seconds before peeling and then plunged into cold water for chilling and peeling. The cut pieces may be dropped into water to which a little lemon juice has been added. Fruit juices such as cider and grape juice may be frozen and stored.

VEGETABLES SUITABLE FOR FREEZING

Among the vegetables commonly grown in Minnesota, those best adapted for freezing storage are asparagus, snap beans, lima beans, cantaloupe, peas, rhubarb, and sweet corn. Picking at the right stage of maturity is of the greatest importance in obtaining a high quality product.

Overmature peas and lima beans may be separated by the following method. Pour the shelled product into a pail of water and stir in a small quantity of table salt until the tender peas or beans float on top and the ones that are overmature fall to the bottom of the pail.

Usually it would not be economical to freeze carrots, peppers, pumpkin, squash, and spinach in a refrigerated locker, although it can be done successfully under proper conditions.

Vegetables not well suited for freezing storage include tomatoes, some of the melons, cabbage, lettuce, celery, and cucumbers. Cauliflower appears

to be difficult to freeze satisfactorily in the refrigerated locker.

VARIETIES SUITABLE FOR FREEZING

All varieties of a fruit or vegetable do not freeze equally well. A list of recommended varieties is given in table 1, based on tests made with Minnesota-grown products in 1936, 1937, 1938, and 1939. Different lots of the same variety may not give uniformly good results owing to differences in quality of the fresh product.

STORAGE TEMPERATURES

Storage temperatures above 10° F. are generally unsatisfactory for most fruits and vegetables except for relatively short periods of storage. At temperatures between 0° F. and 10° F. raspberries, blueberries, asparagus, peas, rhubarb, and cantaloupe may be stored for 9 to 10 months without noticeable loss of quality if the product is properly prepared and packed. Some deterioration in quality may occur after 6 to 7 months in storage with strawberries, snap beans, lima beans, and sweet corn, especially at temperatures above 5° F.

The temperature in most locker-storage rooms is maintained somewhere between 5° and 15° F. and usually does not vary more than 3 to 5 degrees. Any greater fluctuation in temperature is likely to result in loss of quality in the frozen product. Maintenance of a constant temperature is important.

CLEANLINESS IMPORTANT

Unlike ordinary canning, freezing kills only a small portion of the bacteria, yeasts, and molds that may be

present. Since freezing does not sterilize the product, cleanliness is an important requirement in handling fruits and vegetables to be frozen. Bacteria capable of causing digestive disturbances, or even typhoid germs, if present in the material before freezing, are not destroyed by the freezing process.

On the other hand, there is no known danger of food poisoning developing in the product while it remains in a frozen state and no cases are on record of illness caused by the use of properly handled frozen foods.

Prolonged exposure of the product to warm temperatures before freezing or after thawing is risky. All material to be frozen should be protected from insects and rodents during preparation and packing. All sugar used must be clean and free from contamination. This applies also to water. Use only clean drinking water.

PACKING FRUITS FOR FREEZING

Raspberries, hulled strawberries, and blueberries are washed in clean, cold running water. If a sirup pack is to be used, the fruit is then packed into a container, covered with sugar sirup, and the container is closed. It is now ready to go to the freezing room. The fruit should be packed table ripe, not at the stage of ripeness ordinarily picked for shipping.

The sirup is prepared by dissolving 4 pounds of sugar in 6 pounds of water, or 13 standard half-pint cups of sugar to one gallon of water. As individual tastes differ, the amount of sugar may be varied slightly. The sirup may be mixed cold, and it must be cold (or better, chilled) when poured over the fruit. It is important to use

Table 1. Summary of Recommendations for Preparing Fruits and Vegetables for Freezing

Recommended for freezing	Varieties best adapted	Scalding required	Pack preferred
Cantaloupe	Firm fleshed varieties*	None	30% sirup
Strawberry	Beaver, Dunlap, Gem, Premier, Wayzata	None	Sugar or 40% sirup†
Raspberry	Almost any red or purple; Latham preferred	None	40% sirup
Blueberry	Any well-graded berries	None	Sugar or 40% sirup
Rhubarb	Red varieties preferred	None	40% sirup
Asparagus	Washington	2 minutes	dry
Bush beans (green)	Stringless Green Pod, Tendergreen	2½ minutes	dry
Bush beans (wax)	Pencil Pod, Brittle Wax	2½ minutes	dry
Pole beans	Kentucky Wonder	2½ minutes	dry
Lima beans	Fordhook, Henderson, New Philadelphia	3 minutes	dry
Peas	Glacier, Little Marvel, Teton, Thomas Laxton, World's Record, Alderman, Telephone	1½-2 minutes	dry
Sweet corn (cut)	Golden Bantam, Minhybrid 202	3 minutes‡	dry

* Golden Osage, Bender's Surprise, Sugar Rock, and un-named Minnesota selections Nos. 10 and 11 were found to be satisfactory.
 † 40% sirup—13 cups sugar per gallon of water or 5 lbs. 9 oz. sugar per gallon. For 30% sirup use one-fourth less sugar. Substitute a dry sugar pack if the product is to be used for pies.
 ‡ Cut from cob after scalding. Scald 6 to 8 minutes if packed on the cob. Corn on the cob is bulky and storage cost may be excessive.

freshly mixed sirup. Any sirup that stands at room temperature for more than 3 to 4 hours should not be used for this purpose. Provision must be made for expansion in freezing by leaving an air space one-tenth the size of the container. A quart glass jar should be filled no higher than one and one-half inches from the top rim. The ordinary quart carton requires a head space of three quarters of an inch. When unsweetened fruit juices are frozen, the container should be filled only four-fifths full.

For strawberries a dry sugar pack usually is preferred in the proportion of 3 to 4 pounds of fruit to one pound of sugar. The sugar must be thoroughly mixed with the fruit. This is best accomplished by placing 3 to 4 pounds of the hulled and washed berries in a clean enamel pan and sprinkling one pound of sugar over them. The berries are then turned over a few times with a large spoon until each berry is thoroughly coated with sugar dissolved in juice. When this is done,

the product is packed into containers.

Many persons prefer a 4 to 1 sugar pack instead of a 3 to 1 sugar pack because they find the latter too sweet to the taste.

PACKING VEGETABLES FOR FREEZING

Vegetables selected for freezing must be tender. Corn should be in the milk stage. The vegetables are first prepared as for table use, snap beans having the ends cut and the strings removed. Peas and lima beans are shelled. Corn is husked. The product is then washed in clean drinking water and next immersed in boiling water as directed in table 1. Scalding is illustrated on the front cover of this bulletin. The product is then cooled immediately in cold running water, packed in a suitable container, and the container is closed. The vegetable should not remain soaking in the cold water after it is properly cooled but

should be drained and packed at once. This method is known as a dry pack.

A 2 per cent solution of salt brine may be used to cover the vegetable after it is placed in the container, but recent experiments indicate that a dry pack will give equally good results when proper containers are used. A dry pack is easier to use, especially in rectangular containers of the type now made for locker-storage use.

In scalding, the water must be boiling and it must return to a boil within about 45 seconds after the vegetable is immersed, which means that only about one pound of the product can be scalded at one time in an ordinary 10-quart pail on the average kitchen stove. An enamelware or aluminum pail should be used. A woven-wire basket, large strainer, or cheesecloth may be used for dipping the vegetables. Rhubarb does not require scalding; it should be packed in sugar sirup after being trimmed and cut into one-inch pieces.

The time required for scalding is shown in table 1. It may be desirable to vary the scalding period a little according to the size and maturity of the product. For example, large ears of corn require more time than small ears and white lima beans require a slightly longer period than green lima beans.

SUITABLE CONTAINERS

Containers that do not readily permit the passage of air or moisture-vapor should be selected. When ordering containers it is necessary to specify that they shall be made for freezing storage. The ordinary paperboard container used for ice cream and similar purposes is unsatisfactory. If waxed, the coating of wax may not be

heavy enough or the type of wax used may crack at low temperatures.

A rectangular carton with a moisture-vaporproof bag made of transparent cellulose film has given satisfactory results in tests made in Minnesota, being equal in this respect to properly waxed paperboard containers. This type of carton is more economical of space than the cylindrical container. The bags are sealed by applying heat. Special sealers made for this purpose may be purchased. The bags may be sealed satisfactorily but less rapidly with an ordinary electric curling iron, preferably one equipped with a switch to facilitate control of temperature. These bags will not seal properly if the inside is covered with fruit juice, sirup, or water at the top where they are sealed. A simple form may be constructed to hold several cartons in place while they are being filled. The bag should be filled while in the carton. A preserving funnel is useful for filling.

"Enamel lined"² tin cans, with tight fitting lids, are very satisfactory containers for fruits. The ordinary glass jar, sealed with a rubber ring, is a very satisfactory container except that it occupies much space and is not so convenient to handle. Jars with sharp shoulders and those that taper toward the top should be avoided because of danger of breakage in freezing.

FREEZING THE PRODUCT

For satisfactory results, the product must be picked, packed, and frozen on the same day, and the shorter the handling time the better.

Freezing should be done in a room at 0° F. or lower. The containers should be stacked separately in the

²Laquer of type resistant to fruit acids.

freezing room to permit the cold air to circulate readily. This method of freezing is not nearly so rapid as any of the commercial "quick-freeze" methods, and products handled in this manner are not "quick-frozen" according to the accepted meaning of this term. The method of freezing used in locker-storage plants usually is referred to as "sharp freezing."

However, for all practical purposes, the product freezes rapidly enough, especially if packed in containers no larger than two quarts. Containers should never be packed into large cartons or boxes while in the freezing room. The contents of a quart container, filled with a 40 per cent sugar-sirup pack, when placed in a room at 0° F. will require 12 to 14 hours to cool to 5° F. When completely frozen, the product may be removed to the storage locker. Rectangular cartons should be frozen on their side instead of upright to prevent bulging.

The operation of a fan in the freezing room will reduce the time required to freeze the product and is desirable for this reason.

Records

It is desirable to label each container with the name and variety of the product and the date of packing. As a guide to future operations, additional information will be helpful, such as the proportion of sugar used, the time between harvesting and freezing, the scalding period, and the condition of the product when packed. If each container is given a serial number, these details may be entered in a notebook. Containers may be labeled with wax crayon or a china marking pencil. Gummed labels are likely to fall off after freezing.

USE OF FROZEN-PACK FRUITS

As a rule, fruits successfully preserved by freezing may be used in preparing the same dishes as fresh fruits. The majority of them make appetizing sauces for ice cream and puddings or excellent desserts when served alone or with cream. They lend themselves to the preparation of shortcakes, pies, cobbler, fruit whips, soufflés, and in certain instances even to the special dishes for which the different fruits are commonly used, such as blueberry muffins, strawberry and plum preserves, and raspberry jam.

One advantage of using frozen fruits in such products is that they give flavors practically indistinguishable from those given by fresh fruits, provided the fruit has been carefully selected and properly handled during freezing and storage. Another advantage, especially for the red fruits, is that no color is lost in freezing, so that products made from them, even after a considerable storage period, are as bright and attractive as those prepared from fresh fruit. For example, strawberry preserves and raspberry jam prepared from frozen fruit stored six months were found to have as bright a color and as fresh a flavor as preserves or jam made and served while the berries were still in season. They were far superior to preserves and jam which had been prepared from fresh fruit and stored six months, even under excellent storage conditions.

The preparation of products from frozen fruit is so nearly like their preparation from fresh fruits that one's favorite recipes may still be used. Only two important differences need be kept in mind: first, the fruit should be at least partially thawed before it is used, and second, allowance should be

made for any sugar added before freezing.

To thaw, fruit is left in its container unopened until nearly all of the ice has melted. For strawberries, raspberries, and blueberries, the thawing may be done either rapidly or slowly. If done rapidly by setting the container in lukewarm water, a three-pound can of fruit will be ready for use in a few hours; if done slowly by placing in the food chamber of a refrigerator, the melting may take 20 to 24 hours.

No sugar need be added to most products prepared from frozen fruits. The amount used during freezing ordinarily is large enough to sweeten not only the fruit itself but the entire dish. For example, the 3 to 1 packs yield sufficiently sweet pies and cobblers without further sugar. Likewise, the 40 per cent sirup pack gives sauces sweet enough to suit most people.

Preserves and jam, however, will need enough extra sugar to make the total amount equal to the quantity called for in the recipe.

USE OF FROZEN-PACK VEGETABLES

For best results, dry-packed vegetables should be started to cook while still solidly frozen. Brine-packed samples, however, being somewhat protected by the surrounding liquid, show no ill effects during a brief melting period and are usually allowed to thaw just long enough to give sufficient

liquid with which to begin the cooking process. The thawing preferably should be done by setting the unopened container in lukewarm water.

Both brine and dry-packed vegetables are cooked in the same manner as fresh vegetables, except that the cooking period is shorter, ordinarily not more than one half to two thirds as long. For example, green or wax beans usually are tender after cooking in boiling water or brine for 12 to 15 minutes, lima beans 20 to 25, peas 10 to 12, asparagus 5 to 8, and cut (whole kernel) sweet corn 6 to 8 minutes. Special care should be taken to prevent overcooking, for even a slight amount causes deterioration in flavor, appearance, and nutritive value.

EFFECT OF FREEZING ON VITAMIN CONTENT

As a group, fresh fruits and vegetables are excellent sources of vitamin C. Many vegetables are also good-to-excellent sources of vitamin A. Neither of these vitamins is destroyed by freezing or storage at 0° F., but some vitamin C is lost during the preparation of vegetables for freezing. To make this loss as small as possible, the vegetables should be handled promptly after gathering, and the scalding periods should be no longer than those recommended in table 1. If these suggestions are followed, the vitamin C content of properly cooked frozen-pack vegetables should be practically the same as of well-cooked fresh ones.

UNIVERSITY FARM, ST. PAUL, MINNESOTA

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Division and United States Department of Agriculture Cooperating, P. E. Miller, Director. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914. 15M-6-40

E. C. C.