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Storing Fruits and Vegetables in Refrigerated Lockers*

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General recommendations for handling and packing fruits and vegetables for storage in refrigerated lockers are given in Minnesota Extension Bulletin 200. Additional information, resulting in part from experiments with the 1940 crop, is given here-with.

Scalding of Vegetables -- Proper scalding is necessary for all vegetables being prepared for freezing storage, except those to be packed in sugar or sugar sirup such as rhubarb and cantaloupe. The following scalding periods are now recommended, beginning from the time the vegetable is first immersed in boiling water. The water should return to boiling within 60 seconds, otherwise longer scalding may be necessary.

Asparagus	3 minutes	Carrots (diced)	2 minutes
Snap beans	2½ "	Cauliflower	5 "
Small Lima beans	3 "	Peas	1½ to 2 minutes
Large Lima beans	4½ "	Cut corn	2 minutes
Corn on cob -- medium to large ears -- 8 minutes; small ears -- 6 minutes			

Corn should be cut after scalding and cooling. To reduce the loss of sugars, water should be used sparingly or not at all in cooling corn, though it is satisfactory with other vegetables. Corn to be packed on the cob is one of the most difficult of all vegetables to scald satisfactorily. It is difficult to scald the inside of the cob properly without over-scalding the kernels.

Test for Scalding -- A simple test will give a reasonably accurate indication as to whether scalding has been properly performed in the case of carrots, snap beans, Lima beans, peas, and sweet corn to be packed on the cob. Take a clean test tube or any small glass vial or bottle such as olives are packed in for the 10-cent trade. Crush a small quantity of the vegetable between clean paper and place the crushed vegetable in the bottle. With corn to be packed on the cob, the sample should be taken from the center of the cob. Add enough clean water to cover the sample and then add about an equal quantity of ordinary 3 per cent hydrogen peroxide which is obtainable at any drug store. Shake vigorously. If scalding has not been done properly, the active enzyme will cause oxygen to be given off within two minutes or less. A close inspection will reveal oxygen bubbles, usually accompanied by more or less foaming. Make this test on a sample of the unscalded vegetable to become familiar with the reaction to be expected from active enzyme action.

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This hydrogen peroxide test is less dependable for asparagus and cauliflower, and is wholly undependable for the kernels of cut corn. The latter vegetable is so easy to scald properly that testing is much less important in this case than for other vegetables. A test using gum guaiacum is preferred for asparagus, cauliflower, cut corn, and for some other vegetables. The proper method of making this gum guaiacum test may be obtained on request.

Preparation and Freezing -- Methods for the preparation of most of the common fruits and vegetables (except peaches) are given in Extension Bulletin 200. Peaches should be handled even more quickly than for canning to avoid browning. The usual procedure is followed of plunging the fruit into boiling water and then cooling quickly in cold water in readiness for peeling. The fruit should be sliced directly into a sugar sirup or dropped into water to which has been added about one teaspoon of lemon juice per pint of water. Peaches are preserved best by freezing when packed in sugar sirup as recommended for raspberries. A dry pack is preferred for all vegetables that require scalding.

The time of placing the product in the freezer should not be delayed longer than 2 to 3 hours at the most after the containers are filled. If longer delays cannot be avoided, the containers should be held in a household refrigerator at 40° to 45° F., or packed in ice. Filled containers should not be held over night under any circumstances before being taken to the freezer. Containers holding fruits packed in sugar should be turned over once or twice, if possible, during the first few hours in the sharp freezer.

A temperature not higher than 0° F. provides the best storage conditions when maintained within a range of 5°. Storage temperatures above 5° are considered unsatisfactory for best results with most fruits and vegetables. These recommendations are approved by the Committee on Food of the American Public Health Association in its annual report for 1940. Losses of vitamin C in storage increase rather rapidly with most products at temperatures above 5°. Temperatures between 5° and 10° are reasonably satisfactory for most products for at least 6 months, but storage temperatures above 10° are generally unsatisfactory except for relatively short periods of storage.

Capacity of Containers -- A quart container will hold 24 ounces drained weight of dry-packed asparagus, cut corn, peas, Lima beans, cut snap beans, or about 21 ounces of cauliflower or spinach. This amount will provide 8 servings. Cut corn requires about one-third the space occupied by the same quantity of corn on the cob. A quart container of frozen cut corn will hold the equivalent of 8 medium to large ears of corn.

A quart container of frozen berries, cantaloupe, or rhubarb packed in sugar sirup will hold about 20 ounces drained weight of fruit in addition to about 12 ounces of sirup. When packed in dry sugar, this size of container will hold 20 to 25 ounces drained weight of hulled berries or a similar weight of cantaloupe or rhubarb cut into small pieces, together with 5 to 7 ounces of sugar. This amount will provide from 8 to 10 servings.

Cost per Pound of Product -- The total cost of packing and storing fruits or vegetables from the home garden in a refrigerated locker will depend to a considerable extent on the size and type of containers used, the charge made for freezing, the length of time in storage, and on whether or not service charges for the packing operations are included.

It is most economical to maintain a steady flow of products through the locker. Available records indicate a turnover of $2\frac{1}{2}$ to 3 times the capacity of the locker during a year by the average locker patron. The following comparisons of cost are made for freezing and storing a vegetable such as cut corn, on the basis of a freezing charge of one cent per pound, storage of \$10.00 per locker per year, and containers of one to one and one-third quart capacity. The costs shown include the cost of containers (except glass jars), but no allowance for the value of the product or for labor except for filling the rubber latex bags which require special equipment not available in the home.

Type of Container	Approx. Capacity of Locker (lbs.) Net Drained Wt.	Approx. Cost per Lb. Product	
		Storage 4 months	Storage 6 to 7 mos.
Standard glass jar	105	$4\frac{1}{2}\phi$	7 ϕ
Cylindrical, paperboard	135	$6\frac{1}{2}\phi$	8 ϕ
Rectangular carton	190	5 ϕ	6 ϕ
Rubber latex bag	190	$4\frac{1}{2}\phi$	$5\frac{1}{2}\phi$

For purposes of comparison with the cost of canned goods, it should be noted that a No. 2 can contains $13\frac{1}{2}$ ounces drained weight of cut corn.

Retention of Quality after Thawing -- The cooking of frozen vegetables should be commenced, if practicable, before the product is completely thawed. Most frozen fruits are at their best if served about the time that thawing is completed. Frozen fruit should be thawed in the original container which should remain closed. After thawing is completed, the frozen fruit will keep about the same length of time that sugared fresh fruit might be expected to remain in good condition.

The approximate time required to complete the thawing of frozen fruits and vegetables in pint or quart containers is given in the following table, together with the approximate time that the product may be expected to keep without significant loss of quality due to bacterial activity.

Where Held When Removed from Freezing Storage	Approximate Temperature	Time Required for Thawing	Time Product May be Kept Without Significant Loss of Quality
Room temperature	68 to 75°F.	3 to 4 hours	6 to 8 hours
Ice box	45 to 50°	8 to 10 hours	24 to 36 hours
Mechanical refrigerator	40 to 45°	10 to 15 hours	36 to 48 hours
Ice cube compartment	15 to 30°	2 to 3 days	1 to 2 weeks

Equivalent Quantities -- Records taken at University Farm indicate that a 12-ounce package of the frozen product contains the approximate equivalent of the following amounts of the fresh market product:

Snap beans	15 oz.	Blueberries (frozen dry)	1 pint
Asparagus	20 oz.	Raspberries (in sirup)	$\frac{3}{4}$ pint
Lima beans	32 oz.	Strawberries (in sugar)	$\frac{2}{3}$ pint
Peas	32 oz.	Cut corn	4 ears

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