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Michigan State University Extension Service

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Preservation of Fruits and Vegetables in Refrigerated Food Lockers

By H. L. Seaton and Ruth M. Griswold

MICHIGAN STATE COLLEGE : : EXTENSION SERVICE
EAST LANSING

General Directions

Since 1938, there has been a rapid increase in number of the so-called freezer locker plants in Michigan where farmers and townspeople may take their fresh meats, fish, poultry, fruits and vegetables to be frozen and stored for use months later. Quick freezing is essentially a method of fresh food preservation whereby the color, flavor, texture and nutritional values of many fresh products are more nearly retained than by other methods. Many Michigan-grown fruits and vegetables, comparable to commercially frozen products, may be prepared at home, frozen and stored in the refrigerated food lockers, if certain precautions are observed. The suggestions for preparation of fruits and vegetables for freezing given herewith are based on recent experimental work conducted at the Michigan and other state and federal experiment stations.

SELECTION OF PRODUCTS

Virtually all Michigan fruits and many vegetables may be frozen successfully. Strawberries, red raspberries, blueberries, blackberries, sour red cherries, sweet red cherries and rhubarb are all easily prepared and are especially adapted to preservation by freezing. Peaches and the light-colored sweet cherries make excellent frozen products, but discolor (turn brown) badly if not properly prepared. It is doubtful economy to freeze apples and pears because they may be stored easily at home.

Peas, lima beans, corn cut from the cob, asparagus, broccoli, green beans, peppers, spinach and other greens are suitable for freezing, but are more exacting in their preparation than are the small fruits. Those vegetables with a high-water content—tomatoes, lettuce, celery, cucumbers, cabbage and similar crops—as well as those with a high-starch content—potatoes, certain varieties of peas and lima beans—are not adapted to freezing. Corn may be frozen on the cob, but the product requires a special blanching treatment, takes up much valuable locker space, and is not considered as good as cut corn.

Quality of the frozen product depends on color, flavor and texture. All three must be good or excellent if the product is to be satisfactory. Varieties of fruits and vegetables vary widely in those respects, and many excellent canning and market sorts are unsuited for freezing. In the tables given for fruits and vegetables, desirable varieties are suggested. Different lots of the same

variety may give variable results owing to variations in the quality of the fresh products.

PROPER HARVESTING AND HANDLING IMPORTANT

Freezing retains rather than improves the quality of any product. All fruits and vegetables used should be of the best quality obtainable. Fruits should be harvested at the proper stage of maturity for immediate table use. Green or immature fruits lack flavor and lose their color when frozen. Over-ripe, badly bruised or moldy fruits develop off-flavors. Only highest quality fresh vegetables should be used and all tough or over-mature parts should be discarded. The products should be processed within a few hours after harvest. The directions for harvesting, handling and preparation as given in the tables should be followed closely.

CLEANLINESS IS ESSENTIAL

Freezing kills only a portion of the bacteria, yeasts, and molds usually present on the products. Freezing does not sterilize the products and cleanliness throughout all preparation operations is important. There is no known danger of food poisoning developing while the products remain in the frozen state and no danger of illness caused by use of properly handled frozen foods. Prolonged exposure of products to warm temperatures before freezing and after thawing is risky. All water used in washing, cooling, and preparing sirups and brines should be free from contamination. This applies to all utensils, containers and sugars used.

PREPARING FRUITS

Most fruits are washed and prepared as for canning. They are then packed in the containers and covered with sugar sirups or packed with dry sugar, depending on the use for which they are intended. When packed without sugar or sirup, some fruits, especially peaches, are less attractive and palatable. However, this dry pack fruit is satisfactory for pies, preserves and other cooked products.

The sirups may be made with either hot or cold water but should be chilled before using. The table on the next page gives the amounts of sugar to use for one quart of water in preparing sirups of different concentrations.

Preparation Of Fruits For Storage In Refrigerated Lockers

Fruit	Desirable Varieties	Harvesting and Handling Instructions	Preparation	Sugar Sirup Pack	Dry Sugar and Dry Pack
Rhubarb	MacDonald Ruby Victoria	Pack early in season when color is best and stalks are not stringy. Harvest early in morning. Trim off leaves and bases of stalks.	Wash and cut in 1" sections. Do not peel.	Cover with 30-percent sirup.	Pack dry without sugar
Strawberries	Premier Dunlap Gem (everbearing) Catskill	Use only bright red firm ripe berries. Avoid green or over-ripe fruit. Sort, wash, hull and drain thoroughly. Handle quickly.	May be packed whole, cut in slices 1/2" thick, or crushed.	Cover with 20- or 30-percent cold sirup.	Mix 1 part sugar with 3 to 5 parts berries, or pack dry.
Red Raspberries	Taylor Latham	Select firm ripe berries. Avoid those harvested after rains or during hot weather as they turn dark. Rapid handling essential; reduce to minimum to avoid bruising.	Sort, wash and drain thoroughly. Do not crush berries in filling containers.	Cover with 30-percent cold sirup. Rush to freezer as soon as packed.	Mix 1 part sugar with 1 to 5 parts berries or pack dry.
Black Raspberries	Cumberland Logan	Slightly seedy for dessert purposes. Handle same as red raspberries.	Same as red raspberries.		Mix 1 part sugar with 3 or 4 of berries.
Dewberries Blackberries Boysenberries	Lucretia Eldorado	Avoid immature and over-mature berries. Careful and rapid handling essential. Exercise care to prevent bruising.	Sort, wash and drain. Pack loosely in containers.	Cover with 20- or 30-percent cold sirup.	Mix 1 part sugar with 3 or 4 parts of berries.
Blueberries	Jersey Pioneer Rubel Rancocas Wild Low Bush type	Harvest as for fresh use. May be held for several days at cool temperatures. Remove undersized, immature berries and pieces of leaves and stem.	Wash, drain and pack loosely in containers.	Cover with 20- or 30-percent cold sirup.	Dry sugar not recommended. May be frozen without sugar.
Sour Red Cherries	Montmorency	Harvest when fully tree ripe. Immature fruits turn pale and over-ripe fruits dark after freezing. Handle quickly after picking. Avoid soaking in water after washing.	Wash, remove pits and pack in containers rapidly.	Cover with 30-percent cold sirup. Dry sugar packs preferred.	Mix 1 part sugar with 4 parts pitted cherries. Mix well.
Sweet Cherries	Schmidt, Windsor, Bing (Napoleon and other light color varieties are likely to turn brown)	Harvest when firm ripe; immature fruits shrivel, fade and are tough after freezing. Handle carefully to prevent bruising.	Sort, wash, stem, and drain. Pack loosely in containers. May be pitted.	Cover with 20-percent cold sirup.	Dry pack not recommended. Mix 6 to 8 parts pitted cherries with 1 part sugar.
Peaches	J. H. Hale Halehaven Fertile Hale Elberta	Excellent frozen product but difficult to prepare. Harvest at firm-ripe stage, usually a few days later than the stage when harvested for market but before fruit reaches soft-ripe stage. Avoid bruising by excessive handling.	Rapid preparation essential to prevent browning. Peel by submerging in boiling water. Plunge in cold water and rub off peelings. Remove pits and cut each half in 4 or 6 pieces. Pack quickly into containers. Leave as little head space as possible.	Cover with 20- or 30-percent cold sirup, depending on variety and individual taste. Sirup must cover fruit. Seal quickly & rush containers to freezer as quickly as possible.	Not recommended.
Cantaloupes	Hearts of Gold	Select high quality melons with firm-ripe flesh. Cut flesh in balls or squares for cocktails and salads. Entire product must be defrosted before serving to retain shape of balls.	Pack loosely in containers with waxed paper between each layer of pieces.	Cover with 40-percent cold sirup.	Not recommended.
Watermelons	Kleckley's Sweet Northern Sweet				

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SUGAR SIRUPS FOR FRUITS

% Sirup (Approximate)	Amount of Sugar	Amount of Water
20	1 cup	4 cups
30	2 cups	4 cups
40	3 cups	4 cups
50	4 cups	4 cups

PREPARING VEGETABLES

All vegetables intended for frozen pack should be blanched (scalded) before packing, as suggested in the table. Blanching prevents undesirable changes in color and flavor during frozen storage, and makes packing easier. Sufficiently large quantities of boiling water (3 gallons per pint of product) should be used so that the addition of the vegetables will not lower the temperature of the water. Large wire baskets or muslin bags may be used. After blanching, the products should be plunged immediately in running cold water to cool them quickly before packing.

Many vegetables are packed dry but others retain their quality better if packed in a weak salt brine solution. The brine solution used is a 2-percent solution and may be prepared by dissolving 1 teaspoon salt in 1 quart of water, or 4 teaspoons in 1 gallon of water; cool before using.

CONTAINERS

In the selection of containers it is necessary to consider the dehydrating effect of the exceedingly dry air in the locker storage rooms maintained at 0° F. This dry air will extract moisture through paper and other materials which are ordinarily water-proof. Beside drying, certain fruits oxidize (turn brown) if exposed to the air of the locker and vegetables lose their fresh color and flavor. The more effectively the product is protected from air, the better the quality will be. The ideal container for frozen foods is vapor-proof as well as moisture proof. The containers should be straight-sided or larger at the top to permit easy removal of the frozen products. They should be of such shape as to prevent a loss of valuable locker storage space.

Glass jars with well-fitting lids and rubbers are airtight and may be used if handled carefully to prevent breakage, but do not pack well in the lockers. Tin cans may be used if sealed, or if 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, and vegetables packed in weak brine solutions.

Containers of paper board, provided with moisture-vapor-proof linings of cellophane or other suitable material, are satisfactory if properly sealed. Square or round heavily waxed cartons with an air-tight closure are often used for fruits. Most locker plants keep a supply of containers for sale to patrons.

To provide for expansion of the product during freezing, it is necessary to leave from $\frac{3}{4}$ - to $1\frac{1}{2}$ -inch head

space in quart glass jars and about $\frac{1}{2}$ inch in tin cans and paper board containers. That is much more head space than is allowed in canning and varies somewhat with the strength of the sirup used in packing fruits.

FREEZING AND STORAGE

After packing, the prepared products should be taken immediately to the locker plant for quick freezing and storage. If there is any delay, the packaged foods should be refrigerated but not frozen until they can be taken to the locker plant. Upon arrival at the plant, they should be placed in the freezing room immediately. If the freezer room is filled, locker operators should make an effort to hold the products in their chill room until they can be placed in the freezer. Even when kept at a temperature of 35° to 40° F. in a refrigerator or chill room, the quality of fruit and vegetable products prepared for freezing will deteriorate rapidly. For best quality, it is absolutely essential for products to be placed in the freezer very soon after preparation. A low temperature is usually used for freezing, but it should be remembered that the important consideration is the speed with which the heat is removed and the product frozen. An overloaded freezer room cannot do a rapid job of freezing. For best results storage temperatures should be maintained uniformly near 0° F.

LABELS AND RECORDS

All containers should be labelled properly with name, product and date of packing. Gummied labels do not stick well at low temperatures and ink is likely to become smeared. Those materials should not be used. A small piece of adhesive tape may be used on glass and tin containers or they may be marked with a china-marking pencil or pen. A record of the procedures followed with all of the products stored in the locker should be kept in a notebook for future reference.

CARE OF FROZEN FOOD IN THE HOME

Unless frozen food can be kept frozen, it should be used promptly. Once thawed, the food should not be re-frozen. Vegetables should be cooked if they cannot be used within a few hours after thawing.

COOKING AND SERVING

Fruits are considered best when served just before they are completely thawed. Dry pack or sugar pack fruits may be put in pies or into the preserve kettle without thawing. During thawing, the products should be left in the unopened original containers and if the containers used for fruits packed in sirup are leak-proof it is advisable to invert them when thawing. Small packages of fruit in sirup if completely sealed may be thawed in 60 to 90 minutes in cold or luke-warm water.

All frozen vegetables should be cooked before they are eaten. Dry-pack vegetables are considered best when plunged into boiling salted water, but may be allowed to thaw first. Corn on the cob and asparagus should be thawed slightly before cooking. Brine packs may be started cooking slowly while still frozen and the frozen masses broken apart with a fork. A small amount of water may be added to prevent burning.

Cooking periods are shorter than for fresh vegetables by approximately one-half, starting from the time the thawed mass begins to boil. Frozen vegetables, if overcooked, will lose their fresh flavor and color.

Suggested Varieties, Harvesting, Handling, Preparing, Blanching And Packing Procedures For Quick Frozen Vegetables

Vegetable	Suggested Varieties	Harvesting and Handling Instructions	Preparation	Blanching* Time—Boiling Water 212° F.	Packing
Asparagus	Mary Washington	Avoid small and woody stalks. Handle quickly.	For "tips" cut in 4½" lengths. For cut use 1" lengths. Wash thoroughly. Don't use iron utensils.	2 to 3 min.* Plunge in cold water. Drain.	2-percent brine (1 teaspoon salt to 1 qt. water, or ¼ lb. salt to 6 qts. water), or dry pack.
Beans: Green Wax	Kentucky Wonder (pole) Decatur (pole) Stringless Green Pod, Tendergreen, Round Pod Kidney Wax, Pencil Pod Black Wax	Avoid over-mature and small pods. Handle quickly after harvest.	Prepare as for canning.	2 to 3 min.* Plunge in cold water. Drain.	2-percent brine or dry pack.
Beans: Lima	Fordhook, King of the Garden (pole), Burpee Bush, Early Baby Potato, Henderson	Harvest when beans have reached full size but before they have started to turn white and harden.	Shell by hand. Process as soon as possible after shelling. Freeze beans of different color separately or discard white beans.	1½ to 2 min.* Plunge in cold water. Drain.	Dry pack.
Broccoli	Italian Green Sprouting	Harvest as for fresh use. Avoid yellow or tough flower heads.	Examine carefully. Cut in small pieces. Use only tender portions of flower stems. Remove outer yellow leaves.	3 to 4 min.,* depending on size of pieces. Plunge in cold water. Drain.	2-percent brine or dry pack.
Brussels Sprouts	Long Island Improved	Use only medium-sized firm sprouts.			
Carrots	Red Cored Chantenay Nantes or Coreless	As for table use.	Top, scrub under running water, trim, and dice. Young carrots may be left whole.	2 to 3 min.* for diced, 3 to 4 min. for whole carrots. Plunge in cold water. Drain.	2-percent brine or dry pack.
Cauliflower	Snowball, Snowdrift, or White Mountain	As for table use. Avoid discolored or spreading heads.	Examine carefully. Trim and break into small pieces.	2 to 3 min. depending on size of pieces.	2-percent brine desirable.
Corn: Yellow (Sweet)	Golden Cross Bantam Golden Bantam	Harvest early in morning. Select ears with well filled rounded kernels and sweet flavor. Avoid hard and immature kernels. Handle quickly to preserve quality and flavor.	Husk, silk and trim ears. Avoid submerging corn in water as much as is possible. Scald on cob for cut corn.	Cut corn—scald on cob for 2 to 3½ min.* Cool in ice water. Cut from cob and pack. Corn on cob—scald for 8 to 9 min. for medium ears, large-8 to 10 min.	Usually packed dry. Individual ears wrapped in moisture-proof paper and placed in container.
Peas	Thomas Laxton World Record Alderman (Alaska not suited)	Use only adapted varieties. Avoid over-ripe pods. Handle quickly from time of harvest to freezing to preserve quality and flavor.	Shell by hand. Sort out small immature and large hard peas, split peas and foreign material.	60 to 90* seconds. Cool promptly in cold water.	May be packed dry. May be frozen on trays then put in containers.
Peppers (sweet)	California Wonder or similar varieties	Select thick walled green or red fruits.	Wash, halve, remove seeds. Slice or dice, as preferred.	May be packed without scalding or may be scalded for 2 minutes. Cool promptly.	May be packed dry or in 2-percent brine. Latter preferred.
Spinach and other greens	Giant Nobel King of Denmark Long Standing Bloomsdale Viking	Harvest as for table use. Do not hold long before packing.	Wash thoroughly. Remove all discolored leaves and large stems.	Scald for 2 to 2½ min.* Keep leaves moving during scalding and subsequent cooling.	Usually packed dry.

*If steam is used increase blanching time 50 percent longer than given for boiling water.