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Preservation of Fruits and Vegetables

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PRESERVATION OF FRUITS

INTRODUCTION

During this national crisis in food products, we must not overlook the matter of food conservation and preservation. It will avail us little to produce large quantities of food-stuff only to let it spoil. The shortage of tin cans and glass containers will make it more imperative than ever that we pay a little more attention to the evaporation of fruits and vegetables.

The evaporated products have the advantage that they have relatively small bulk and will keep a long time. In addition, they can be put in cheap containers and are much less expensive to ship than canned or fresh products. Certain products which under normal conditions may not have been in very brisk demand should now command a good market. The army and navy, as well as the agents from foreign countries will very materially increase this demand. Because of the high cost of living moreover, many people will plan to prepare foods for their own consumption.

The cost of evaporating products will depend much upon the original condition of the fruit and the method used. It must be remembered that culls will make a culled dried product; that if a really good grade product is desired, fruits and vegetables which are fit only for cider and hog feed should not be employed. Some of the lower grades could be utilized for home consumption, but they would have very little merit on the market. Sun-dried products, unless unusually well handled, are not of as high grade as those which are evaporated in buildings. In drying on a cook stove or in the sun, an effort should be made to drive off the water as quickly as possible and to take steps to avoid abnormal discoloring. Unnecessary exposure to the sun will increase the discoloration and make the product very unattractive in appearance.

We should plan to utilize the dried products in our home more than we have in the past. Formerly such products were used very generally, especially on the farms. There are sections of the United States, such as Pennsylvania, for example, where the dried apple is a well-known product. If more care were taken in preparing the product there would be a greater demand for it. Several commercial houses in Oregon are preparing dried fruits and vegetables of such high quality that when they are cooked it is hard to distinguish them from the cooked fresh product.

In many communities it will be well to have the work so organized that it can be handled on a community basis. Much saving of labor and fuel could be brought about by such a practice. The community can also cooperate in grading. It is just as essential to grade an evaporated, as a fresh product.

The amount of evaporated fruits consumed in a small community is much greater than the average person realizes. In a small community in Eastern Oregon consisting of four hundred and fifty people, this past year 4,000 pounds of dried apples, 4,000 pounds of dried peaches, 4,500 pounds of dried prunes, 1,500 pounds of dried apricots, and 1,000 pounds of miscellaneous dried products were consumed. This includes only what two small groceries handled, and does not include the products handled by mail order houses which were considerable.

BUILDINGS FOR THE EVAPORATION OF FRUITS

This state is at present fairly generously supplied with prune and hop driers. Unfortunately, however, these buildings are largely confined to limited sections; namely, the Willamette and Umpqua Valleys. Occasionally one finds driers in other portions of the state; wherever they are found they should be utilized. The prune driers, both tunnel and stack driers, can be utilized for both fruits and vegetables. This has been demonstrated by a number of men in this state for several years. At the time of the Alaskan gold rush many of these evaporators dried vegetables for the trade, and today several men with ordinary evaporators are turning out a most excellent grade of dried fruits and vegetables. With the prune drier the main effort should be to keep the trays clean and arrange the building so that the product can be handled rapidly. Hop driers can be utilized for both fruits and vegetables. There is no reason why buildings so constructed as to maintain the desired temperatures should not be utilized for the evaporation of fruits and vegetables. The apple driers over the country are principally the hop-drier type.

The regulation floor constructed for the evaporation of fruits is generally made of basswood or poplar. The floor consists of strips $\frac{3}{8}$ " thick and generally about 1" wide at the top and only $\frac{1}{2}$ " at the bottom, nailed about $\frac{1}{4}$ " apart. These floors allow the heat to come up nicely and if kept clean, either by scrubbing or by a treatment of tallow and oil as described under the evaporation of apples, a splendid product can be turned out. We suggest that anyone contemplating the erection of a building for the evaporation of apples, pears, peaches, or apricots, communicate with us. We shall be glad to give directions concerning the construction of such driers, which should be of the kiln type. Where a building is to be constructed for the evaporation and drying of vegetables, we suggest the utilization of steam wherever it is possible. Force the air over steam pipes and work it rapidly across the vegetables so as to evaporate the moisture rapidly. If proper temperatures are maintained, such as suggested under different sections in this bulletin, a splendid product should be obtained.

A large amount of fruit and vegetables can be evaporated at home either on the kitchen range or out of doors on little portable evaporators. We are describing such types in the closing pages of this bulletin. In many parts of the state sun-drying can be carried on nicely. It must

constantly be remembered, however, not to over-expose the fruit to the sun and to be sure that a thorough sweating of the product takes place after evaporation.

Preparation of Fruits and Vegetables

If the fruit or vegetables to be evaporated are unclean, they should be thoroughly washed. This should be followed by peeling. Wherever the product is to be peeled (such as apples for example), peelers can be secured, run either by hand or by power, that will peel from one hundred to one thousand bushels a day according to power or capacity. Machinery for slicing can also be obtained. Little hand slicers for apples and pears can be purchased for a few dollars that will slice fifty bushels a day, and large power outfits can be obtained that will easily slice one thousand bushels a day. Lye has sometimes been used in the peeling of certain fruits such as peaches. We do not advise its use, however, as it tends to discolor the fruit. If one is contemplating the evaporation of fruits and vegetables on a large scale, it will by all means pay to install considerable machinery. There are various types of carriers and endless belts, as well as special machinery for preparation, which will greatly reduce the cost of preparing the product. This is essential where one is entering into the business on a commercial scale and where competition from various sections of the country must be met.

Sulfuring

In order to secure a high-grade product with some fruits it is essential to sulfur. There is some objection to sulfuring, which has provoked a great deal of discussion. If sulfuring is overdone, possibly there is too great an accumulation of sulfurous acid and the rule should be to sulfur only as long as it is absolutely essential. Sulfuring, however, performs a very useful office in the handling of evaporated fruits. It removes discoloration which comes from exposure of the fruit to the air; it tends to keep away insects, thus preventing the fruit from becoming wormy; it prevents the development of certain fungus diseases such as mold; it shortens the time required for evaporation and greatly improves the grade of the product; it also improves the keeping quality of the fruit.

Sulfuring can be done either with simple or elaborate equipment. The simplest equipment would be an air-tight box under which you could place the trays of fruit or vegetables. Under the lower end of the box there is generally a little pit dug out in which the sulfur is to be burned. This pit should be deep enough so that there is no danger of excessive heat from the burning sulfur, which might injure the fruit, or of the box catching fire. A damper is generally arranged at the lower end of the box so that the burning sulfur can secure plenty of air. Often an outlet is arranged at the top of the box. This can be kept tightly closed during the sulfuring process, but can be opened to free the box of fumes. In outdoor drying they sometimes construct wooden hoods, which can be let down over the stacks of trays by means of blocks and tackle.

Where large quantities of fruit are to be sulfured cement-sulfur boxes are found to be satisfactory. These, of course, are expensive and their construction is not warranted unless a large output is to be expected. An ordinary dry-goods box which is carefully lined with paper can be very easily converted into a sulfur box. The sulfur can be burned in a tin pail, such as a lard pail, or in a piece of terra-cotta. The sulfur may be ignited in various ways, such as using a wick made of burlap, dropping hot coals on the sulfur, using red hot irons, or by the use of alcohol.

The length of time the product should be exposed varies tremendously with the product to be evaporated. Recommendations for the desirable length of time for each fruit are given under the various fruits in this bulletin.

In arranging for the evaporation of fruits, one must make provision for the sweating. It is necessary to have bins or rooms where the fruit may be piled quite deep. This tends to make the fruit of uniform moisture content and improves its general appearance. Where practical these bins or sweating rooms should be made moth proof to prevent these insects from depositing their eggs on the fruit.

EVAPORATION OF APPLES

When apples are dried in an evaporator the product is classed as evaporated apples. When dried in the sun the product is classed in the market as dried apples. Dried apples become very useful in many homes from the first of April to the first of August when apples are very scarce. Such a product is very palatable in sauces and pies. Apples can be very nicely dried at home. In all parts of Oregon this could be done very easily. The fruit for this purpose should be peeled and cored and then either quartered or sliced. The fruit, thus prepared, may be dried out in the sun on trays, or the quarters may be strung on strings and hung up against the sunny side of a building or may be taken inside and hung on racks behind the kitchen stove or on nails driven in the wall.

Such product is generally rather dark colored; it might find a limited sale. There are parts of the United States, indeed, where such fruit is sold commercially in considerable quantities. In Pennsylvania, for example, they have for a long time been famous for their "schnitz," which is nothing more nor less than the dried apples which are produced for home use or sold on the general market.

Home Drying

If one so desires, the apples can be very nicely dried at home in cook-stove driers or portable orchard driers. The fruit for such drying may be sulfured, also, thus making it more marketable on that account.

For home use almost any variety of apples would be fairly satisfactory, although the better quality stocks, especially those having good cooking qualities, should be preferred.

No general rules can be laid down for the length of time for home drying. This must depend very largely upon the judgment of the person doing the drying. The best rule to follow would be to watch the condition of the fruit. Fruit should never be dried until brittle. As soon as it is dried to the point where it is spongy, elastic, and rather velvety in texture, the drying should cease. It is well then to stack the fruit in fairly large containers and allow it to sweat somewhat. This will tend to give the fruit a uniform degree of moisture. The fruit is then stored in crocks or sacks until ready to be used.

Were one planning to erect a building for the drying of apples, we would urge the kiln or hop-drier type of structure. Should one desire to build such a type of drier, we shall be pleased to give further assistance. There are in many parts of the state a great many prune and hop driers. We urge the use of such buildings for the evaporation of apples.

Steps in Process of Evaporation

In preparing the fruit for the evaporator, first peel and core; then trim off the pieces of skin which are generally found around the stem and calyx. Cut out, also, any imperfections such as decayed portions, worm holes, etc.

Prepare to slice the apples just as soon as possible after they have been peeled and trimmed. Bleaching should be kept down to a minimum and should take only from one-half to one and one-half hours, depending upon the condition of the fruit. The whole fruit or quarters require less bleaching than when the fruit is to be sliced. If the fruit is to be dried whole, place in heated room, because it must be constantly remembered that in the evaporation of fruits and vegetables the product must never be placed in a cold evaporator. We would urge the drying of whole fruits, if possible, especially if very good fruit can be obtained. If the fruit, however, is of an inferior quality, then it would probably be better to quarter or slice it. This should be done as soon as possible, and the fruit then rushed into the heated rooms. The slices are made at right angles to the core, thus producing what is known as the rings.

If the hop-drier or kiln type of building is to be used, the floors must either be scrubbed with soap and water, or given a dressing of boiled linseed oil and tallow. Such treatment will be necessary every few days. The fruit is placed on the floor and piled to a depth of from three to six inches. It is not advisable to pile slices quite as deep as quarters or whole fruit, because there is less air circulation. The temperature should be from 150° to 160° F. to start with and can be gradually lowered to about 125° F. during the process of evaporation. If a kiln drier is used, it will be necessary to stir the fruit quite frequently after the first four or five hours. Where the prune drier is used, little or no stirring will be required. The time it will take to dry the apples, from five to fifty hours, will depend upon the condition of the fruit. Sliced fruit is often dried in about five hours. The quarters will probably take about twenty hours and the whole fruit from thirty to fifty hours. The length of time,

however, can not be arbitrarily set. It will fluctuate with the type of building, intensity of heat, etc. One should be guided by the condition of the fruit. It should be dried until it is spongy, elastic, leathery, and velvety. Dried apples, however, should not contain much over 25 percent of water.

Packing and Grading

As soon as the fruit is cured it should be piled in fairly large quantities so it will sweat, thus insuring a uniform degree of moisture throughout the entire pile. As soon as this has been accomplished, the fruit can be packed. Generally about three grades are used. The first is known as the white stock or fancy, and must be strictly high grade as regards color, texture, etc. The second grade is generally allowed a few minor defects. The third grade, also known as prime, is allowed more defects. Fifteen percent of rings which are not perfect could be used.

The packages for the sale of such fruit will be either boxes or cartons. Wooden boxes of fifty-pounds capacity, size 10½"x11"x22", are quite frequently used. A box of twenty-five pounds capacity will measure 9"x9"x18". Cartons which hold about one pound of fruit are quite popular. The fruit is packed by a system very similar to that we use in the handling of prunes in this state.

The quantity of dried fruit obtained varies extremely with varieties. Some apples like Russets have been known to give as high as nine pounds of good fruit to the bushel. The average range of most apples would be from six to seven pounds with about three pounds of low grade or waste material. The whole apples would tend to run a little higher than the sliced or quartered.

The prices to be obtained will depend very much upon texture and color. The lighter the color and firmer the texture the better.

Varieties for Drying

In the East the varieties that are used most are the Baldwin, Ben Davis, Grimes, and Esopus Spitzenberg. The varieties that are generally classed as giving good white stock are the Baldwin, Ben Davis, Esopus Spitzenberg, and Northern Spy.

The golden stock will include such varieties as Rome, Stayman, Jonathan, Winesap, Mammoth Black. The dark varieties are the Wagener, Newtown, and Grimes.

By-Products

Unless one is especially careful there will be a considerable waste in the handling of evaporated apples. The peelings can be utilized splendidly for jelly, and the trimmings and cores may be made into vinegar or fed to stock. Before the war there was some demand for such waste products in Europe where it was used for wine manufacture. The chops and waste

are generally dried either in a separate room, or on the roof. During the winter such products can be worked into jelly, vinegar, etc.

EVAPORATION OF PEARS

The market demand for dried pears is increasing, with indications that the area to be supplied can be very much enlarged. At present there are about 3,000,000 pounds of dried Bartlett pears sold annually. Previous to the war many of these went to Germany and the Scandinavian countries. At the present time the demand seems to be fully as brisk in our own country among peoples descended from the races of Northern Europe. After the war is over there should be an increased demand for the product.

Dried Pears a Choice Food

Very few Americans use dried pears. This is a product which should be consumed in much greater quantities. The lack of knowledge of preparation or cooking is probably responsible for this light consumption. Dried pears are delicious when properly prepared. The following recommendation for cooking dried pears was furnished by Mr. Frank T. Swett of Martinez, California:

"Wash the fruit clean and simmer for half an hour. By that time the pears will have swollen to almost original size, but will not have softened so as to fall to pieces. If you keep on stewing they will become too soft. Take the pears out; lay them in a shallow dish or pan; strain the water back over them; sprinkle them with sugar; flavor to taste if you wish with spice; and bake fifteen minutes. They will come out of the oven nicely baked, with the sugar crystallized on the surface. Serve with cream and you have a dish that everybody enjoys. Dried pears, according to analysis, are one of the most nutritious of fruits, and at the same price a pound have a greater food value than dried apples."

The amount of dried fruit produced from the green varies according to the condition of fruit. It will take all the way from four to seven pounds of green fruit to make one pound of dried. A firm-grained pear of high sugar content is the one most desired. Fruit, to bring the highest market prices, must be of a good grade, free from scab and frost rings and of a smooth, fine grain. Culls will not produce a high grade of dried pears and if they are put up one must be content with very low prices or use them for home consumption.

Steps in Drying

Before preparing the fruit for drying, it should be well graded according to size and condition. All culls should be removed. If there is a shortage of boxes, pears can be stored in sheds or bins. They should be placed on a clean surface, such as straw, and if they are covered with blankets or canvas the ripening period will be hastened.

In preparing pears for drying they are first halved and then the stems and calyx are removed. In some cases the cores are removed. The fruit should then be put in clean containers such as trays or bins, flat side up and as close together as possible. In California, for drying in the

sun, trays 8'x3' are generally used and should preferably be made of either pine or spruce. Flush over with water to remove all dirt and foreign material.

There are sections of Oregon where the pears mature so late that sun-drying will not be feasible. On the other hand, many portions of Southern and Eastern Oregon could sun-dry pears very nicely.

Sulfuring Pears

As soon as the pears are placed on the trays they should be sulfured. If this is delayed too long and the fruit is allowed to become greatly discolored, it requires much more sulfur, which is undesirable. In the outdoor drying the pears are sometimes exposed to sulfur fumes for as long as forty-eight hours. It requires about two charges of about four pounds of sulfur for twenty trays. The pears are exposed one day and two nights. If allowed to be exposed to the sun too long the fruit becomes discolored.

Sun Drying

The fruit is now placed on trays and the trays stacked fifteen or twenty high. One-inch strips are placed between the trays to encourage air circulation. The trays are generally stacked on the slant, one end being considerably higher than the other. Plenty of air space should be left between the stacks in order to insure good air circulation. If convenient, these trays are stacked in sheds where they are not exposed to rains. If stacked out of doors, a protector must be placed on top so as to shed the water. Under good weather conditions the fruit will be ready to be taken from the trays in from one to four weeks. When the fruit is removed from the trays it should be more or less rubbery in texture and never in a soft condition. The fruit should then be placed in clean containers, preferably boxes, and can be stacked in such a way that the air can still circulate. When the pears are handled in this way, the drying process will continue.

A few men in Oregon have been drying pears. One man has been practising sun-drying and is adding sugar, producing a fancy product which has had a fair demand.

A number of growers are using prune evaporators. The growers here practice sulfuring for three or four hours. The pears are exposed on the trays for about the same length of time as is required for prunes, although a lower heat than for prunes is desirable.

There is no reason why a large quantity of pears cannot be dried in prune evaporators in Western Oregon, and with a little effort people can be educated to purchase this product.

PEACHES AND APRICOTS

Most of the dried peaches and apricots found on the market are sun-dried products of California. The prices for peaches generally range

rather low, but under present conditions demand and prices will both probably increase.

The fruit for evaporation should be ripe but not a dead ripe. Soft, mushy fruit is worthless for evaporation. The more highly colored the fruit is, the better. Unripe fruit makes a poorly colored, inferior product, while if the fruit is too ripe it will flatten out to a paste.

Preparing the Fruit

The fruit is rarely peeled. It can, however, be peeled by machinery or by the use of lye. The latter, however, tends to discolor the fruit. The Royal apricot is the favorite for evaporation, although the Moorpark will give a good product. Almost any variety of peach can be used. The weight, however, will vary considerably with the variety. Dried peaches of such varieties as the Muir give about one pound of dried fruit to four or five pounds of fresh. Some of the soft varieties require seven or eight pounds of fresh for each pound of dried. While the freestones are easy to handle, the clingstones give a better product. To handle the clingstones, however, one must have a curved knife and a spoon-shaped pitter. The fruit should be very carefully cut in two and the pit removed so as in no way to break down the cups formed when the pit is taken out. If the cups are broken the juice will run out and there will be a decided loss in weight, and the trays, moreover, will become very sticky and hard to handle.

Sulfuring Peaches

Place the fruit on the trays with the cup up. The trays used for outdoor drying are about 8'x2½'. As soon as the fruit is placed on the trays it should be sulfured. The sulfur will tend to draw out the juice so that the cups will fill. Sulfuring should take about three and one-half hours. It is claimed that by the use of sulfur insects and worms are repelled, diseases such as mold are kept away and the fruit dries much more rapidly, owing to the fact that the juice is drawn into the cups. In addition, the fruit is much more attractive.

Length of Drying Period

The length of time, and temperature, for drying will vary according to the method. Do not over-dry the fruit as it will make the peaches brittle. On the other hand, if not dried sufficiently, they will be soggy. The fruit should be so dried that when several pieces are squeezed together in the hand they will come back again to normal condition. They should be elastic, spongy, and of good color.

With bright warm weather peaches will dry in two or three days. If the weather should be more or less cloudy, they might require ten days. In drying with artificial heat a temperature of about 140° F., to start with, and 170° F. at the finish would give good results. When drying out of doors do not set the trays directly on the ground but have them slightly raised so that there will be good air circulation.

As soon as the fruit is finished it should be taken immediately from the trays and put into bins or some such place where it can be piled in considerable quantities and allowed to sweat.

Disposal of Pits

There has been, as a rule, a pretty good demand for pits of peaches and apricots for the manufacture of prussic acid. It might be difficult to dispose of small quantities, but there is a good demand for large quantities of seed.

CHERRIES

Cherries are one of the most attractive fruits dried. The large dark meaty Lambert and Bing cherries make a very palatable product. They can be used in cooking in the place of raisins and are very desirable as a confection. They dry very easily. One often notes how the small seedling cherries will dry on the trees. They may be dried whole or pitted. The pitted product is more satisfactory. A small cherry pitter can be obtained on the market. Sun-drying is very satisfactory. The cherries mature at the time of the year when we are apt to have clear, warm days. It is very easy to dry the cherries on cook stoves or in portable evaporators. Prune driers turn out a very nice product.

Treat the cherries the same as other fruits. A desirable temperature is from 130° to 140° F. to start with, and about 160° F. for the finish.

PRUNES

No attempt will be made in this publication to treat of the evaporation of prunes. A special circular will be published on this subject, since there are so many people in the state who are especially interested in the evaporation of this fruit.

BERRIES

One of the easiest and most satisfactory fruits to dry or evaporate is berries. They can be nicely handled at home, dried on trays out in the sun, dried in a small home evaporator, or can be handled to good advantage in the prune driers. One must take care in evaporating berries in the sun or at home not to over-dry them. The tendency is to dry them until they lose their color and become extremely brittle. This is a mistake. Dry the berries as rapidly as you can without burning them and dry them only to a point where they will be spongy and elastic. Great care must be taken in handling the berries after they are dried. There is a moth that is apt to lay eggs on them and cause the product to become wormy unless carefully protected.

With a little effort, local consumption can be materially increased. The black cap is well established on the market and there is a fair demand for the red raspberries. This demand heretofore has been largely foreign, but in some sections the American trade is requiring more of this prod-

uct. Blackberries make a satisfactory product. Loganberries have become a staple product although in unknown markets will take very poorly. If a good product of loganberries is obtained we would suggest trying to sell them to people who have already developed markets rather than attempt to advertise them on unknown markets.

Dried berries can be utilized for jellies, jams, marmalades, and beverages.

LOGANBERRIES

Great care must be used in harvesting the loganberry. Bruised, leaky fruit will not make a good product. The berries should be firm and ripe and as nearly uniform in ripeness as possible. This fact should be kept in mind for all fruits and especially for berries. If the trays contain some green fruit, some firm ripe and some soft ripe, the result will be a very poor, almost unsalable product. The green berries make a bright-colored, attractive-looking product, but are too tart and dry down too much. In harvesting berries, pick them if possible in the cool of the day. Do not put too much fruit on a tray and be sure to spread the fruit on very evenly. Otherwise it will dry unevenly. About sixteen pounds, that is, fourteen boxes, is enough for the average prune tray. In outdoor drying be careful not to over-dry or over-expose to the sun. This will bleach the berries and deaden the color, making a rather inferior product. Experience has shown us that we get a much better product with rapid drying. Formerly the loganberry growers who dried the berries in prune driers started the temperature at 100°. This simply wilted the berries down, caused them to leak and caramelize, and made a loss of several ounces to the tray.

Temperature for Drying Loganberries

The most desirable temperature that we have experienced has been 130° to start with and 150° to finish, maintaining at the same time a good strong draft. Shorten the tunnel so that you will not use over twenty feet. In this way you can turn out a very attractive product in from twelve to sixteen hours and there will be little caramalizing or dripping. The higher temperature and shorter time will give a greater weight of fruit and a more attractive product. Be sure and not over-dry. Never allow the berries to become brittle and hard.

Berries should be taken off the trays when still warm so as to avoid sticking to the trays. The fruit should then be piled about 2½ feet deep and turned every few days. The amount of fruit secured will depend upon the condition of the berries and the method of evaporating. If there has been a great deal of rainy weather the berries will dry down more than otherwise. The first few picked contain more water than those picked in the middle of the season or later. It takes about four to six pounds of fresh fruit to make one pound of dried.

Cost of Evaporating

The cost of evaporating will vary. Following is a table showing the approximate cost for each ton of evaporated fruit:

Wood	\$12.00
Labor	25.00
Interest on Evaporator.....	7.00
Insurance	1.80
Depreciation of Building.....	6.00

\$51.80

The cost of evaporating any kind of fruit varies with the size of the evaporator, and especially with the management. The above table gives only an approximation of the ordinary costs. Wasteful and careless methods will increase the cost very materially. The cost for each pound of evaporated fruit is about 2½ cents, based on a thirty-day season, with an evaporator capable of turning out 700 pounds of fruit every twenty-four hours. If the same building is used for prunes, the interest charges and depreciation will be cut in half, and the final cost reduced to 2¼ cents a pound.

Before placing the berries on the market they should be packed either in small-sized cartons or boxes of fifty-pounds capacity. As a rule the berries are not processed, but where processing—that is, turning live steam into the product—has been tried, on a small scale, the claim is made that it is well worth while. Careful grading should be given. If you have used uniform berries, little grading will be necessary. Simply remove the scorched and burned berries; with the right method of handling there should be a very small amount of such fruit.

RASPBERRIES

Dried raspberries are a staple product on the market, especially the black caps. They are better known than loganberries, although not equal to the latter fruit for some purposes. They require less drying than the loganberry as they tend to run heavier. The Gregg and Ohio are two varieties for evaporation because they are solid and dry. The better canning varieties like the Munger, America, and Plum Farmer are giving a splendid quality product, although they will probably dry-down more. Black-cap raspberries should give from 450 to 500 pounds of dried fruit to a ton of green. In eastern sections where such fruit is handled in large quantities, the berries are seldom hand-picked, but are jarred off the bushes with little paddles looking much like tennis rackets. The berries fall from a sack or canvas apron down into a container. At the bottom of the apron there is a wooden arrangement so that the apron can be forced in under the bushes. In a section of Idaho a system has been tried whereby the berries are allowed to become ripe on the bushes, cutting the fruiting canes and later thrashing off the berries. It requires, however, a special implement for cleaning.

Black caps can be very easily sun-dried and are very satisfactory to handle in a small home drier. The temperature required for drying will be much higher than that for loganberries. In the stack driers of Western New York an average temperature of from 200° to 275° F. is maintained at the bottom of the drier and about 100° F. at the top. Under such conditions the berries are dried in four or five hours. An average stack drier contains about twenty-five trays measuring 5'x5' and this number of trays will accommodate about thirteen bushels of fruit.

There is no reason why black caps cannot be splendidly handled to good advantage in any of our local driers in Western Oregon. The length of time to dry will depend on such factors as the condition of the fruit and the temperature maintained. A variety like the Ohio which is exceedingly dry will evaporate in a very short time. In handling the red raspberries care must be taken not to over-dry them, or there will be very little left but a collection of seeds. With careful drying, a good bright product can be obtained.

Some of the purple varieties like the Shaffer can also be used. These purple varieties do not give as much dried fruit to the ton, however, as the black varieties, but range from 400 to 425 pounds of dried to a ton of green.

Sweat, and handle the same as other berries.

BLACKBERRIES

Dried blackberries are in some demand for pie and jam stock, but the product is rather low priced as large quantities of sun-dried berries are produced in the Southern states and in California.

The method of handling is much the same as for loganberries. The blackberry is firmer and will require less drying. About 400 pounds of dried fruit can be obtained from a ton of fresh.

FROZEN FRUITS

Each year there is an increase in the business being done in the Pacific Northwest with frozen berries. The idea of freezing berries is not of recent origin. A great many years ago strawberries were frozen in gallon cans and kept in cold storage. When needed they were thawed out slowly and if used promptly were acceptable for short cake.

Of late, however, large quantities of frozen berries have been put up on the Pacific Coast and shipped East. These are placed in paraffine lined barrels.

Formerly equal parts of sugar and berries were used in many cases. More recently, owing to the high price of sugar, ten pounds of sugar have been used for twenty pounds of fruit and even in some cases no sugar has been employed. The berries should be sound; in handling, first place a layer of berries and then a layer of sugar. Good space should be allowed at the top for expansion. The berries are put into cold storage and held at a temperature of about 14° F. If they are held much lower than that there is danger of the containers bursting. The fruit is shipped East in refrigerator cars. The solid material is used for jams, jells, and sundaes

and the liquid part is used in the manufacture of juices and sirups. In places where storage plants are found this work might be taken up on a community basis for at least local consumption. The berries to be handled are preferably red raspberries, such as Cuthberts, loganberries, and blackberries.* Such fruit can be kept for a long time if proper temperatures are maintained.

Other fruits as well as vegetables can also be preserved by freezing.

UNCOOKED JAMS

Berries can be used to splendid advantage in uncooked jams. Take an equal measure of berries and an equal measure of sugar. Be sure that the berries are perfectly sound. Crush the berries and mix with an equal amount of sugar. Be sure the berries and sugar are thoroughly mixed. This can be done all at once or occasional stirrings can be given over a period of three or four days. Place the berries in fruit jars unsealed. If sealed, the product will probably spoil. Any cover which protects the fruit from dust, but does not seal air-tight can be used. These jams are vastly superior to the cooked jams. They maintain their natural flavor. The red currant is especially delicious with meats, while blackberries and raspberries can be used as straight jams or for filling for short cake. The black raspberry is in some respects the most satisfactory fruit for use in uncooked jams. Being less juicy than the other small fruits, it makes a more compact jam, of superb flavor, and rich appearance.

WATER PROCESSED FRUITS

Some fruits can be handled with straight water. Rhubarb and gooseberries are frequently put up in this way. A good sound fruit must be used. Fresh water is allowed to run into the jars for a considerable time and then the jars are sealed.

EVAPORATION OF VEGETABLES

Preservation of vegetables by evaporation depends on reducing the moisture content so low that destructive organisms and enzymes cannot act. It is necessary to carry the process further than with most fruits since there is so little sugar present that it does not act as a preservative.

The object in evaporation is to preserve the material with as little change from the fresh state as possible in quality, taste, odor, nutritive qualities, and general appearance.

General Methods of Preparation. It is essential at the very beginning that only fresh, sound and ripe or mature material be worked with, the quality of the final product depending in large part upon the kind and condition of the fresh article used. All vegetables should be handled as soon as possible after being picked, in order that the resulting product may be of best quality. The preparation needed for putting the vegetables in condition to be dried is often identical with that required for

* Some prefer the phenomenal to the loganberry, claiming it has a brighter color. This is a question of some dispute.

canning. Most of the vegetables should be thoroughly washed and cleansed either by soaking in water or scrubbing with a brush or by subjecting to a strong spray of water. The different vegetables will then be given any special treatment according to the kind, that is, will be peeled, trimmed, cut into proper lengths,—directions for which will appear further on. Where vegetables are being handled on a large scale, it is often best to invest in special vegetable cutters, peeling knives, slicing machines, etc.

It often happens that with age dried vegetables take on the odor and taste of hay due to faulty preparation. The presence in most vegetables of albuminous material which is subject to a slow breaking down, due to certain ferments contained in the plant, is the cause of this condition. It is, then, frequently necessary to subject the vegetables previous to drying to a temperature sufficiently high to coagulate quickly the albuminous matter and so arrest further organic changes. This is accomplished by placing the product in a wire basket or colander and scalding or blanching, (not bleaching, but "blanching" as canners use the term) in steam or boiling water for a short time; i. e., generally from five to eight minutes, this process being followed by a rapid cooling by dipping in cold water. The use of steam will alter the flavor and color less than where boiling water is used. This operation, useful for almost all vegetables, is indispensable particularly when working with peas, beans, onions, cabbage, turnips, and parsnips. It also serves to remove excess acid and objectionable flavors, hastens the drying and prevents spoiling, due to this form of sterilization. In the case of carrots, beets, and tomatoes this will help in removing the skin and in most cases it tends to produce a more tender product. It is worth noting, however, that this parboiling is often dispensed with where vegetables are being handled on a large scale in properly equipped factories.

In some of the larger establishments, certain vegetables undergo what amounts to a regular cooking prior to evaporation. For this operation, to save time, they are generally placed in pressure cookers.

The vegetables, when properly prepared, are spread evenly on trays made of wooden slats, cheese cloth, or galvanized wire cloth, or on the drying floor. They should not be spread too deep, or the drying will be too slow and some of them may spoil before the operation is finished. For sun-drying, the trays, often covered with a light netting to keep off insects, are exposed to the sun until dried, care being taken to protect them from dew and rain. Sometimes in connection with sun-drying the latter part of the operation is in the nature of a curing, which is done by stacking the trays of vegetables before they are quite dry and allowing them to stand that way for several days. Where the oven or the top of a cook stove is used, and the material is spread on ordinary plates, there is little to be done save to prevent the material from scorching until it is finally dried.

Where evaporators are used care must be exercised not to raise the temperature too high, as vegetables tend to scorch much more

easily than fruit. From approximately 155° to 175° F. is generally all the heat that vegetables will stand, and many require even less than this. There should be every provision made for a steady, fairly rapid, flow of air, it being much better to use an abundance of air at a low temperature than less air at a higher temperature.

Vegetables dry much more rapidly than fruit, the time required depending on the humidity, the temperature, and the rate of flow of the air, as well as upon the kind of vegetable being dried, the amount of moisture contained therein, and the size of the individual pieces. A general rule which would apply to all vegetables is, reduce the moisture generally to below 12 percent, avoiding, however, over-drying. The product, in general, will appear rather leathery and spongy when the drying is completed, although it is safer in most cases to carry the process still further until the dried pieces of vegetables are quite brittle. In this condition, however, avoid handling them in such a manner as to cause them to break into smaller pieces, as this will spoil their general appearance.

In all cases, it is important that the air in the evaporator be raised to the desired degree of heat prior to introducing the vegetables, in order that the product may start to dry as soon as possible after being prepared, and may dry rather rapidly, otherwise there is grave danger of souring and spoiling the product. Controlled circulation and heat are essential to success.

Steps in Drying Vegetables

A general outline of the steps which would apply in most cases is as follows:

Gather

Wash

Grade or sort where necessary

Prepare

Blanch with steam or boiling water (sometimes salted), generally five to eight minutes, wherever blanching seems advisable.

Further Preparation:

Spread on trays or drying surface.

Evaporate at proper temperature.

Store where there is no danger of spoiling.

Stirring shortly before the drying is finished, when this can be done, will often be an advantage in making a more uniform product.

Table I gives general directions for the evaporation of our common vegetables. Most of the figures must necessarily be largely relative rather than absolute; since, as has already been suggested, there are so many factors which might enter in to affect the results.

SUPPLEMENTARY REMARKS

Green beans. To retain natural color, it is sometimes customary to make the blanching water slightly alkaline by adding 5 percent sodium

TABLE I. DIRECTIONS FOR EVAPORATING VEGETABLES.

Kind of Vegetable	Method of Preparation.	Blanch in steam or boiling water.		Optimum drying temperature,	Approx. yield dried
		Minutes.	Degrees F.	Percent.	
Asparagus	Wash, trim, cut into convenient lengths, grade.....	5-6	120-140	7	
Asparagus tips.....		5	120	6	
Beans, green§.....	Wash, string, cut larger into 1½" lengths, grade.....	6-7	100-120	12	
Beets§	Trim, wash, peel,* slice ¼"-½" thick.....	7-8	175	10-12	
Brussels sprouts.....	Whole or halved.....	See cabbage		9-10	
Cabbage	Trim, slice thin using only the inside parts.....	5-10	140	8	
Carrots	Trim, wash, peel,* slice or quarter.....	7-8	150	8-10	
Cauliflower§	Trim, cut in pieces using only best parts.....	4-5 (steam)	130-140	8	
Corn§	Husk, silk, blanch on cob, dry on cob or cut or scrape off.....	5 (on cob)	180-190		
Onion	Trim outside scales, slice thin.....	8-10	160	12	
Parsnips	Trim, wash, peel, slice ¼"-½" (see turnips).....	Cook	150	12	
Peas, green.....	Pick tender, shell, grade.....	6-8	110-125	7-10	
Potatoes§	Wash, peel, slice (dip in water slightly acidulated).....	2-3 or cook	160	15	
Pumpkin§	Peel, cut into 1"-2" pieces, or convenient chunks.....	8 or cook		12-15	
Rhubarb	Trim, peel, cut into convenient lengths 1½"-2".....	5-6	5		
Squash§	See Pumpkin).....				
Tomatoes	Wash, peel,* cut in two horizontally, squeeze gently.....	4	140	6-8	
Turnips	Trim, wash, peel slice ¼"-½". (Often cook in steam or slightly salted boiling water until slices are transparent).....		150	8-10	

* Skins will slip off easily after blanch and cold dip.

§ See below for special remarks on this vegetable.

carbonate. Drying at too high a temperature will spoil beans and cause them to lose color.

Beets. To retain color, do not trim tops or root too close until after blanching and peeling.

Cauliflower. The product will turn yellow, but will in measure resume natural color on cooking. Sulfuring before evaporating for not over four to five minutes will tend to preserve the color. Evaporate rather slowly.

Corn. May be dried either on or off cob. The kernels may be either cut off or slit with knife and meat scraped out. After drying kernels, rub to loosen hulls and run through fanning mill. The blanching is needed to set the milk.

Potatoes. Several methods are used in drying potatoes in addition to the one given. (The German methods are here omitted.) Potatoes are sometimes thoroughly cooked, generally with steam, then mashed through a screen or sieve on to trays covered with cloth and then evaporated. Sometimes potatoes after peeling (which may be done by hand, machine, or lye) are put into a bath acidulated with 1 percent sulfuric acid or citric acid and then washed in running water before drying. This prevents darkening of the slices. Potatoes are occasionally cut into cubes instead of slices.

Unless handled rapidly, potatoes are very apt to become sour. Should souring occur, all the product so affected should be thrown out or destroyed and the trays thoroughly cleansed and sterilized.

Pumpkin and Squash. Sometimes a mashed product is obtained by steaming until soft, squeezing through a colander or sieve and then drying on cloth-covered trays.

Dried Peas, Beans, and Lentils. Can be easily preserved without a special evaporator. A general rule is to collect before completely mature, although at maturity they will be satisfactory. Dry or cure carefully either on the vines or picked off. Then shell by hand, flail, machine, or by tramping.

Herbs and savory plants may easily be dried to keep indefinitely either by suspending the plants in a warm dry place, or in evaporating outfits, or around a stove. By breaking or pulverizing, they can then be put into convenient form of a powder.

Flour substitutes are sometimes made from pumpkins, beets, and potatoes.

Soup mixtures, (Julienne), are made by combining in desired proportion several kinds of dried vegetables such as carrots, potatoes, onions, peas, etc. chopped fairly fine. (Broken slices and chips can often be used in this form.)

Boiled dinner vegetables are mixtures of larger pieces of several kinds of vegetables.

Packing and Storing. As the product leaves the evaporator, it is first piled not too deep in bins, allowed to sweat for several days, or weeks even, during which time it is often well to stir occasionally to

prevent heating and molding. This curing process allows the pieces dried too hard to take moisture from those not dried enough so that in the end the product will be uniform.

For the market, the vegetables are packed in various-sized containers from cartons holding a few ounces to boxes containing 25 to 50 pounds, according to the demand of the trade.

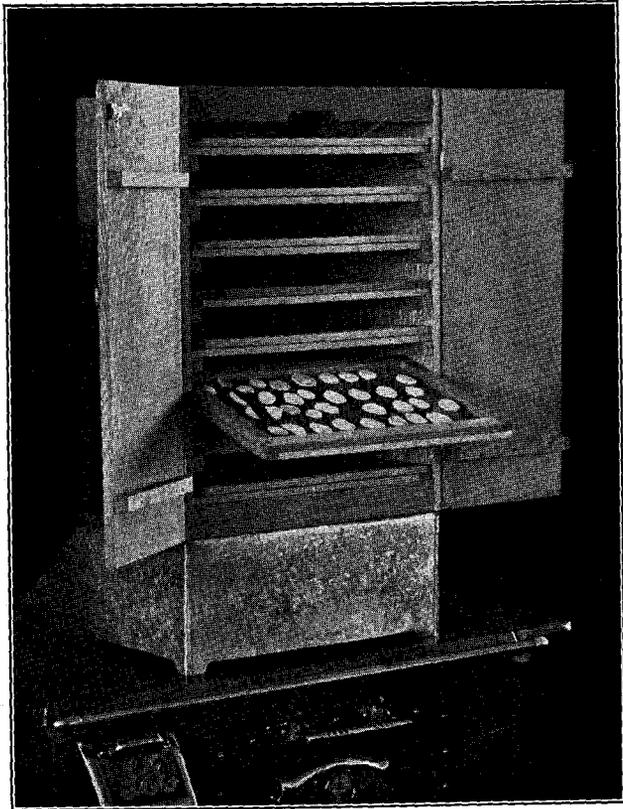


Fig. 1. Home evaporator for top of stove.

At all times great care must be exercised that the evaporated product be kept where it will neither take on too much moisture, which would cause spoiling, nor be accessible to harmful insects.

Prices. The prices paid to growers are often sufficiently high to make it well worth while to grow vegetables to sell to evaporating concerns.

The prices asked for the finished products vary considerably from year to year but considered on the basis of the market quotations for canned vegetables are very reasonable.

How to Use. To use dried vegetables, a general recommendation is to soak in cold water for several hours or over night, the amount of water depending on the kind of vegetable and the relative percentage of moisture which it has lost by evaporation. An excess of water is not desirable. When the product has assumed its former size, it may be used in any way in which it could when fresh. It is advisable where the vegetables are to be boiled, to boil them in the same water in which they have been soaking.

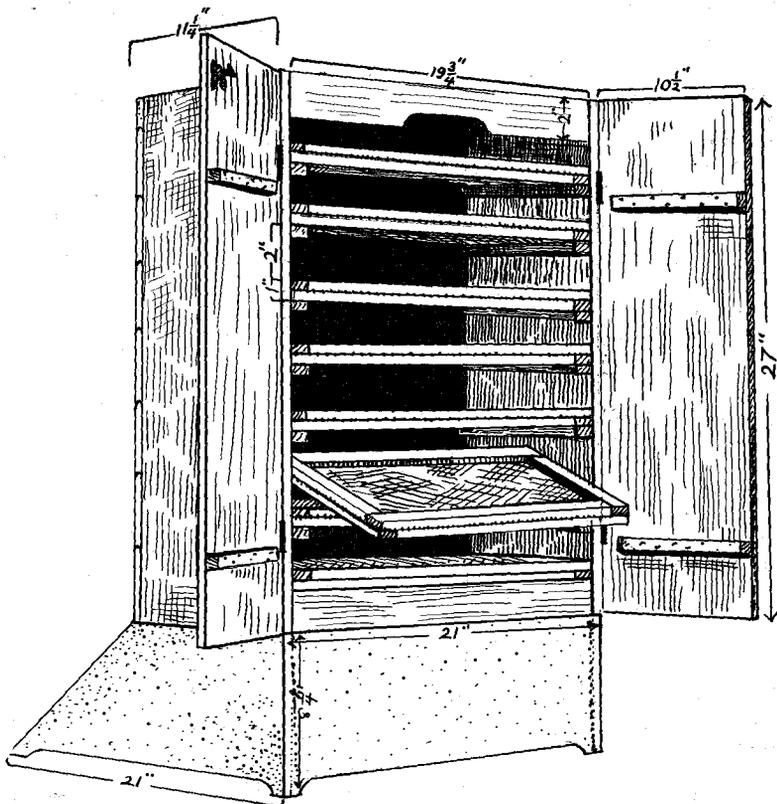


Fig. 2. Detailed plan for constructing home evaporator.

HOME EVAPORATORS

An important field for evaporation is on a small scale in the home, using heat from the kitchen range, oil or gas stove, laundry stove or heater. A home evaporator should be simple and convenient, inexpensive to build and operate, with ample provision made for intake, discharge, and uniform circulation of heated air through or around the product being evaporated.

There are a number of small evaporators on the market, but the one here shown (Figs. 1 and 2) well illustrates the possibilities for one type.

The cabinet is 12 inches wide by 21 inches broad by 27 inches high, open top and bottom to allow unimpeded air circulation, and contains eight interchangeable and reversible trays of small mesh galvanized-wire cloth, inserted between double wooden frames. The base, of No. 27 galvanized sheeting, is nailed to the cabinet by $\frac{5}{8}$ inch flangers turned in at right angles on the upper edges of the metal base. This base is 8 inches high by 21 inches wide by 21 inches long, this length allowing the foot to gather heat from under the warming oven. The opening at the bottom on all four sides allows free intake of air close to the hot surface of the stove.

For those who prefer, it is easily possible with a little ingenuity to work out an inexpensive home-made drier to suit the individual needs. By re-adapting and altering use can be made of the sheet metal oven for the oil stove, of odd boxes, packing cases, smoke houses, etc., while old wash boilers, lengths of stove pipe, or five-gallon oil cans may be re-fitted to make fireproof parts. While cloth tends to retard the flow of air, trays can be made of cheese cloth, burlap, or ordinary wire screening, save that acid fruits are apt to corrode the wire, unless it is galvanized. With these few suggestions to go on, there ought to be little excuse for any home not having at least a small evaporator for the top of the stove.

PRESERVATION OF VEGETABLES IN BRINE

The use of salt as a means of preserving certain kinds of vegetables has much to recommend it; since there is required no expensive equipment nor complicated process to accomplish the desired results. This method, however, has in the past been used with only a limited number of vegetables, and while it might work successfully with others, it would be safer to give it a trial on a rather small scale at first.

Salt, because of its ability to inhibit bacterial action which causes spoiling, is said to have antiseptic or preservative powers to some extent, and it is because of this, where the brine is strong enough, that there is no need for sealing in air-tight containers, but instead, the products may be kept in earthenware crocks or in wooden kegs and barrels. This fact recommends this method particularly for home use. Products which have been so preserved will easily keep a year.

Method. All vegetables to be "put down" in brine should, for best results, be gathered when in prime condition and handled while fresh. They are first washed; trimmed; peeled; etc., according to the needs; then generally placed in a sieve, wire basket, or other container which will provide for easy draining and scalded or blanched for a short time, in a weak brine; rinsed; packed; and weighted down. The general method followed will be illustrated by using green string beans as an example.

Green beans. Gather; clean; string; snip; blanch or scald not over four to five minutes in boiling salted water (or by steam); cold dip or rinse for fifteen minutes in cold, fresh water; drain; place in barrel or other container, (not metal), in layers, each layer being covered with coarse salt. When the barrel is nearly full the contents are weighted down with a board in diameter slightly smaller than the diameter of the

container. The packed beans are first covered with a cloth, on top of which is placed the board, a stone or other weight on the board serving to compact the contents of the barrel. Over the beans pour cold water which has previously been boiled, until the beans are entirely submerged in brine. Keep in a cool, dark place.

No further attention may be needed. It is safer, however, at the end of two to four days to drain off the brine; boil, cool and pour back into the barrel, being sure that the brine is strong enough and that it completely covers the contents. At any later time, should the beans show signs of spoiling, or the brine becomes too muddy or discolored, suggesting imperfect preservation, the brine may be drawn off and reboiled, cooled, and more salt added if needed, or else entirely fresh brine may be poured over them.

Artichokes. Remove seeds; blanch five minutes in boiling salt water; cool in fresh water; then proceed as outlined for green beans.

Cabbage. A special modification of the ordinary brine method is generally used in handling cabbage, the resulting product being called sauer kraut. The process is really one of fermentation under favorable conditions with a development of lactic acid in quantities sufficient to act as a preservative.

There are several "kraut" recipes, but in every case the general treatment and the principles involved are identical. Solid-headed, white varieties are to be preferred. The green outer leaves are trimmed off and the core generally removed, although for best flavor the core is also cut into the kraut. The heads are then sliced into long thin strings by means of a kraut cutter, or at home this may be done with a large knife.

As soon as sliced the cabbage is packed into a barrel or stone jar in thin layers, each layer being sprinkled with salt and each pressed or stamped to make as firm as possible and drive out the air. The proportion of salt used is generally 2½ percent, that is, 2½ pounds of salt to 100 pounds of cabbage. Where available, a few juniper berries are put between each layer. When the barrel is filled a cover is put on which will go inside the barrel and this is weighted down.

In a few days the brine will appear and fermentation should be allowed to proceed for about one month or until it stops naturally. While fermenting, the temperature should not be too low, never below 60° F., or there will be danger of putrefaction. Unless it has been sealed and sterilized in jars or cans, as is often done, the same spoiling is apt to occur if kraut is kept too long before used, it being safer to use it during the winter or early spring. The kraut should always be covered with brine. It is ready for use as soon as fermentation is over.

To use, remove any discolored part on top and taking out, from below this, the desired amount, replace the board and weight so that the kraut in the barrel is never exposed to the air. The kraut is then freshened in several changes of water and finally cooked for a long time, often with pieces of salt pork, bacon, sausage, or other additions to suit the individual preference. When well prepared, sauer kraut has a very agreeable flavor, is healthful and very easily digested.

Cauliflower. Trim off outside leaves and core; break apart; blanch in weak brine (or boiling water containing 1 oz. sulfite of soda to 12½ gallons water, where its use is not objected to) two minutes; not long enough to cause the product to become mushy; cool; then proceed as for beans.

Cucumbers. May be picked and "put down" from time to time as they reach the desired size. They are packed in barrels, or crocks, generally without blanching. Brine may have to be reboiled and more salt added several times.

Tomatoes. Sound, not over-ripe tomatoes should be used. No blanch. Cover with cold 12° brine, four days later drain and cover with fresh brine of same strength.

Brine. The exact strength to use will differ according to the kind and condition of the product. Vegetables containing a large amount of water will tend to weaken the brine more than those with less water, hence a larger proportion of salt to water will be needed in the brine in the former cases. A brine made by using 7 pounds of salt to each bushel of green beans and covering with water would be sufficiently strong for that product. Where a "Beaume" tester, such as is used for testing lime-sulfur spray solutions, is available the brine may be tested from time to time and be maintained at 10° to 12° for all vegetables. Cheap salt will work fully as well as the more expensive refined table salt.

Precautions. The product must always be covered with the brine. A little salad oil floated on the surface of the brine will retard evaporation. Do not use a metal container — use earthenware, stone, or wood. Too weak a brine will not prevent spoiling. Use plenty of salt. One ounce of bi-sulfite of soda to eight to twelve gallons of water in the brine will aid in preventing mold or fermentation, although its use is not recommended in a commercial product because of legal restrictions. Where there is no legal objection to its use, one-half ounce copper sulfate in twelve gallons of water as a blanch will tend to hold the green color in such vegetables as green beans and cucumbers.

How to Use. Remove the desired amount from the barrel, freshen by soaking in several changes of water for twelve or more hours. After this, the vegetables may be used in any way desired. While it is not claimed that they will equal the fresh article, vegetables put up in this way may furnish attractive additions to the supply of green foods at a time when they will be most acceptable.

This is a very convenient way of holding vegetables which are intended for pickling, such as cauliflower, corn, cucumbers, peppers, onions, etc. For this they are removed from the brine; freshened, then covered with boiling vinegar, etc., or whatever method of pickling is to be used.

As has been stated, comparatively little has been done to determine the full possibilities of brine as a method for preserving vegetables. It is suggested that in addition to trying the vegetables here named, people who have other kinds on hand might find the system a good one to apply to those also; as, for example, to preserve celery for soup stock.