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SUGAR-BEET SIRUP

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THIS BULLETIN tells how to grow sugar beets in the garden and describes a simple process of making from them a palatable and nutritious table sirup with a pleasant flavor. A patent for the process of making the sirup has been issued to the authors of this bulletin for the benefit of the public, so that any one is free to use it. Tests by farmers as well as the Department have proved the process to be practicable.

Sugar beets may be grown in any locality which has tillable soil that is capable of producing good crops of vegetables. A small piece of ground is sufficient for planting a few rows of beets—enough to furnish the family with sirup. The tools needed are necessary in almost any garden operation—a spade, a hoe, and a rake.

All sugar beets, if properly handled, will produce sirup. The beets are cut into thin slices and soaked in hot water to extract the sugar. The liquid is then boiled down to the thickness desired. Detailed directions are given in the following pages.

SUGAR-BEET SIRUP.

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GROWING SUGAR BEETS FOR SIRUP.

THE production of beet sirup consists of two distinct operations: (1) The growing of the raw material, the beets, and (2) the making of the sirup.¹ The sirup making embraces two essential operations, the extraction of the juice from the roots and the reduction of this juice to the desired consistency.

Sugar beets may be grown and sirup produced in any locality which has tillable soil capable of producing good crops of vegetables. Therefore, anyone having a small piece of fertile, tillable ground and the usual garden implements, a spade, a hoe, and a rake, is equipped to grow the beets necessary for the production of a home supply of sirup. In some localities the beets produced are richer in sugar than they are in other localities, but all sugar beets, if properly handled, are capable of producing sirup. The richer the roots are in sugar, the larger the quantity of sirup that may be produced from a given quantity of roots and the less the time that will be required to reduce the juice to the desired consistency.

To those who are not familiar with the growing of sugar beets the following brief directions and suggestions may be helpful.

SELECTING THE LAND.

The ground selected for growing the beets should be well drained and fairly fertile. Extremely poor, shallow, sandy, or hard soil

¹ A patent for this process of making sirup from sugar beets (patent No. 1155806, Oct. 5, 1915) was issued to the authors of this bulletin, H. C. Gore and C. O. Townsend, U. S. Department of Agriculture. Tests of the process were made by farmers under the direction of Mr. William H. Burns, of the Office of Sugar-Beet Investigations, assisted by Mr. Charles G. Crawford, a collaborator in the same office.

should not be used for beets until it has been put in proper condition for crop production; likewise, ground that has been very heavily manured should be avoided, since such soil sometimes produces very large roots, poor in sugar. A few rows of sugar beets in the garden will generally be sufficient for a supply of sirup for home use. A bushel of beets will produce from 3 to 5 quarts of sirup, as indicated in the illustration on the title-page. Beet roots when mature should weigh from 1 to 2 pounds each; hence, 30 or 40 average beets will make a bushel. These facts will enable one to estimate the area that will be needed to produce the home supply of sirup.



FIG. 1.—A beet root of good shape.

If more beets are grown than are necessary for the sirup supply, it should be borne in mind that they are excellent for the table. When partly grown the entire plant may be used as greens, and when mature the roots may be cooked and served like garden beets. All sugar beets are white, but when properly grown they are generally much richer in sugar than the garden beet and just as tender. Sugar beets, either raw or cooked, are excellent feed for chickens, hogs, and other live stock.

PREPARING THE SEED BED.

Having selected a suitable place for growing the beets, the ground should be plowed or spaded to a good depth, remembering, however, that too much raw soil should not be brought to the surface at one time. The reason for a deep root bed for sugar beets is apparent from the shape of the root, as shown in figure 1. The ground should be plowed or spaded in the fall, but good results may be obtained by doing this work in the spring provided the ground previously has been in good tilth. As early in the spring as conditions will permit the ground should be harrowed or raked until it is firm, smooth, and free from humps. The surface soil should not be too fine, especially in those sections where high winds are expected during the early summer. The ground should be kept free from weeds, but should never be worked when too wet. The proper time, always, for working the ground is when it is friable; that is, when it falls apart readily when handled.

PLANTING THE SEED.

Sugar-beet seed usually may be obtained, at least in small quantities, from the large seed dealers. A pound of seed will plant one-tenth of an acre if the work is done carefully. Usually a few ounces of beet seed will produce a quantity of beets sufficient for sirup making and for table use for the average family. The seed should not be planted until the ground is warm and the other conditions right for quick germination and for the subsequent growth of the plants.



FIG. 2.—A garden seed planter.



FIG. 3.—Blocking sugar beets.

Sugar-beet seed should be planted in rows about 20 inches apart and may be dropped either in continuous rows or in hills. If planted in hills each hill should contain from three to six seed balls, and the hills should be about 10 inches apart; if planted in solid rows the plants should be blocked in the manner described below as soon as possible after they are up. The seed should be covered to a depth of one-half inch to 1 inch. The covering should be as shallow as conditions will permit; that is, it should not be so thin that it will dry out and leave the seed without sufficient moisture for germina-

tion, and it should not be so thick that the young plants can not readily get through to the light.

In growing sugar beets commercially the seed usually is planted with a 4-row drill designed especially for the purpose. In planting small lots of beet seed for sirup making, a garden planter of any of the usual makes, as shown in figure 2, will be found satisfactory. These planters can be set so that they will plant seed either in solid rows or in hills. In case a planter is not available, an area sufficient for sirup-making purposes can be planted easily by hand. In this case a shallow furrow may be made with a rake handle or other convenient implement and the seed dropped by hand and covered by using the back of the rake.

CARING FOR THE PLANTS.

As already indicated, the seed should be planted in solid rows or in hills. When in solid or continuous rows the plants should be blocked. Blocking consists in cutting out with a hoe or other implement a part of the plants so that the remaining beets stand in tufts about 10 inches apart. In blocking the beets, the direction of the stroke should be at right angles to the row, as shown in figure 3. As soon as the plants are large enough to be handled conveniently, they should be thinned to one plant in each hill or tuft. This operation must be done by hand, since the plants in the hills or tufts stand very close together. The plants should be cultivated and hoed from time to time, in order to keep down all weeds and to furnish the best possible conditions for growth.

If the natural water supply is not sufficient, the beets should be irrigated when they show signs of needing moisture for their proper growth and development. If the beets wilt during the day and fail to recover at night, they should be watered. In case of irrigating, a furrow should be made several inches from the beet row and the water should be allowed to run-down this furrow until the ground is thoroughly wet. In no case should the surface of the ground around the beets be flooded, since flooding often causes a crust to form around the beet, cutting off the air supply from the root and thereby retarding the growth of the plant. From one to three irrigations should be sufficient in most sections where the rainfall is not abundant enough to produce satisfactory beets.

HARVESTING THE ROOTS.

In most sections of the country from four to six months are required for the beets to reach their proper size and stage of development. The proper stage for harvesting will be indicated by a yellowish tinge of the foliage and by the fact that the beets when pulled leave the ground almost free from dirt, as shown in figure 4. If the patch

of beets is large the roots should be loosened by means of a so-called lifter, of which there are two kinds, the double-pointed and the side lifter. The latter is similar in appearance to a subsoil plow and is operated alongside the beet row, loosening the beets without breaking them. The plants then can be pulled and thrown into piles or rows.



FIG. 4.—Field sugar beets, the kind to be grown in the garden for sirup making.

If the patch of beets is small and a lifter is not at hand, the beets may be loosened by means of a spade or a 2-tined lifting fork and thrown into piles. The beets should then be topped by cutting them off squarely at the point where the lowest leaf was attached. The topping can best be done by means of a heavy knife; usually a single stroke is sufficient to top a beet. The roots can then be made into sirup at once, or they may be stored until a more convenient time.

STORING THE ROOTS.

The roots may be stored either on the surface of the ground or in a pit or a cool cellar and kept for several months. The following suggestions will be helpful in storing beet roots, either for sirup-making purposes or for seed production. The simplest and least expensive method of storing the roots is to throw them into a pile on the surface of the ground, selecting for this purpose a well-drained spot. Dirt should then be thrown over the pile until it is almost or completely covered. If the weather is mild, the top of the pile should be covered very lightly or left entirely open for a few days until the roots have passed the heating stage. As the weather gets colder more dirt should be added, to prevent the roots from freezing and to keep them from wilting.

The second method, namely, the pitting of the roots, is accomplished by digging a hole or pit in a well-drained place, the size of the hole depending upon the quantity of roots to be stored. The roots should then be placed in the hole and the surface covered with dirt, lightly at first, and the covering increased as the weather gets colder. If the beets are stored in a cellar they should be packed in moist sand or covered with sand or dirt to keep them from wilting.



FIG. 5.—Beet roots for seed. Roots saved for seed should have the leaves removed without injuring the crown.

The two points to be kept in mind in storing beet roots are (1) to keep the roots cool without letting them freeze and (2) to keep them from wilting. They will work up much better if they are kept fresh and crisp, although the wilting does not materially change their quality.

SUGAR-BEET SEED.

Those who are interested in the making of beet sirup from year to year, especially in the cooler portions of the United States, may grow their own seed if they so desire. Just how long seed can be produced in this manner without serious reduction in the quality of the roots has yet to be determined. However, the indications are that at least several generations of beet plants may be produced without reducing the quality of the roots too low for sirup-making purposes. Two growing seasons usually are required for the production of

sugar-beet seed from seedling plants. It is necessary, therefore, that the beets produced the first season be gathered in the fall and stored in the manner described above. In case the beets are to be used for seed production they should not be topped, but the leaves should be removed either by twisting them off or by cutting them off with a sharp knife without removing or injuring any part of the crown, as shown in figure 5. In this condition the beets should be stored until spring. They should then be planted in a well-prepared root bed just as early as weather and soil condi-

tions will permit. The early planting of the roots seems to be an important condition in beet-seed production.

The planting may be done by thrusting a long spade into the earth; the spade should then be pushed forward, the root crowded down back of the spade, as shown in figure 6, and the spade withdrawn. The dirt should then be packed around the root, the crown of which should be flush with or slightly below the surface of the soil, so that the crown is covered with a thin layer of dirt. A light covering over the crown seems to be of advantage in preventing it from drying out, and it also is a protection against late frost.



FIG. 6.—Planting beet roots for seed.

The roots should be well supplied with moisture during the entire growing season, irrigating them if necessary, especially when the seed is forming. When the seed is ripe, it may be gathered by pulling it from the seed stalks by hand. The habit of growth of the seed stalk, shown in figure 7, indicates how easily the seed may be gathered. It should be spread in a suitable place to dry, after which it is ready for the next year's planting. No artificial heat should be used in drying the seed. Each plant should produce

from a few ounces to a pound of seed; hence, a very few roots will be sufficient to furnish the ordinary family with an abundant supply of seed.

MAKING SIRUP FROM SUGAR BEETS.

PREPARING THE ROOTS.

The first step in making beet sirup consists in topping and cleaning the roots. As already stated, the crowns should be cut off at the point of the lowest leaf scar. The reason for this is that the crown or upper part of the beet contains a large part of the salts taken from the soil in the process of growth. It is desirable

to have the sirup as free as possible from these mineral salts which, if present in too large quantities, would render the sirup unpalatable.

In cleaning the roots, they may be placed in a tub or other suitable receptacle and covered with cool water, to loosen the dirt and to

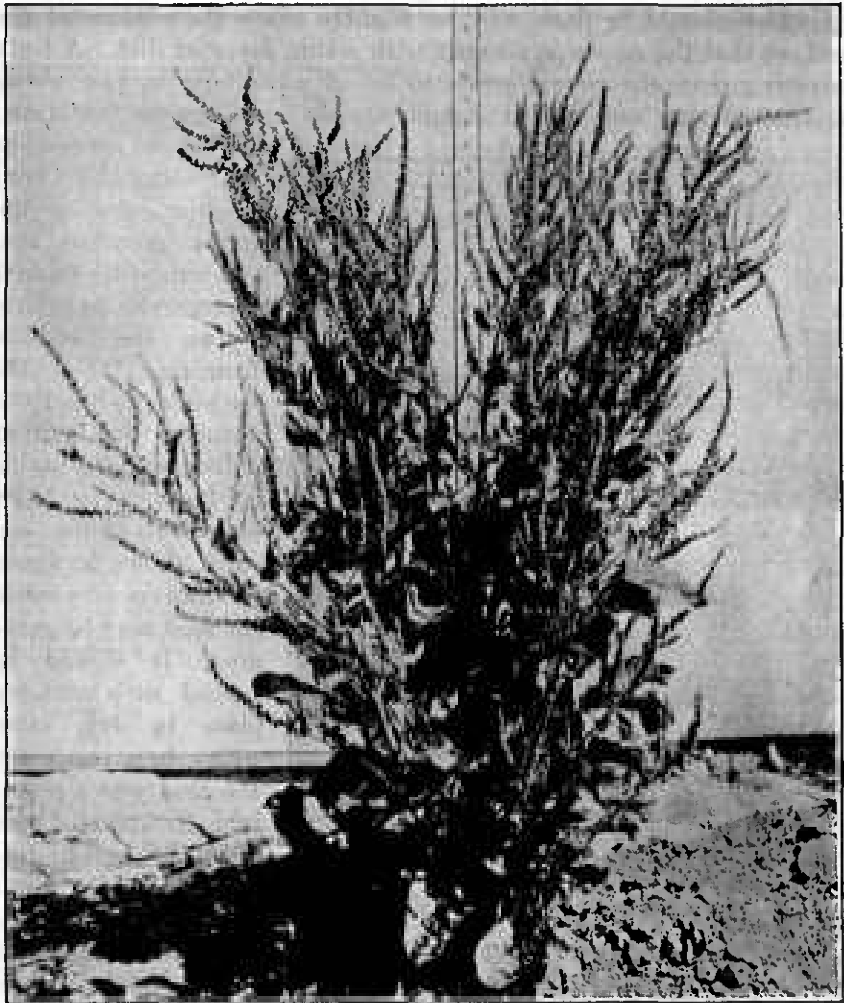


FIG. 7.—A common type of beet seed stalks.

make the roots more crisp. After soaking for a few minutes, until the dirt is loosened, they should be thoroughly scrubbed. A coarse brush with stiff bristles or wire is useful in this work. After the roots are thoroughly washed they should be cut into thin slices. A 3-bladed kraut cutter securely fastened on the top of a barrel, as shown in figure 8, has been used in field experiments and found very satisfactory. The upper head of the barrel should be removed,

so that the beet slices will fall directly into the barrel. If a kraut cutter is not at hand, any slicing device, the simplest of which is a butcher knife, will be satisfactory. The slices should be very thin. The thinner the slices the more rapidly the sugar is extracted. In field experiments slices only one-sixteenth of an inch in thickness were obtained. The slicing box of the slicer was not used, the beet root being held in the hand and pressed against the blades of the slicer.

EXTRACTING THE SUGAR.

A bushel of beets will make approximately 2 hushels of slices, which should be placed in a barrel and covered at once with hot water. About 10 gallons of water will be required to cover them. An excess of water should be avoided, since it would increase the amount of evaporation required to reduce the solution to the desired consistency. If boiling water is used, the temperature of the slices will reduce the temperature of the water to about the proper degree, from 70° to 80° C. (158° to 176° F.), for the extraction of the sugar. The barrel should be covered with several thicknesses of canvas to hold the heat. The sliced beets should be permitted to soak for about 60 minutes, and the barrel should be agitated from time to time without uncovering it.



FIG. 8.—Barrel with upper head removed and kraut cutter securely fixed in place.

The water should now be drawn off and strained through several thicknesses of cheesecloth. No pressing is required to remove the juice from the beet. If the barrel is provided with a faucet near the bottom for the purpose of drawing off the liquid, it will be found convenient. The soaking does not remove all the sugar from the beet slices, but by far the larger part of it is extracted if the slices are sufficiently thin and the water is of the proper temperature. The resulting liquid is of a light-brown color, with a sweetish bitter taste. The refuse beet slices are a valuable feed for chickens, hogs, and other live stock.

BOILING THE JUICE.

The juice may be placed in a kettle or other convenient receptacle, where it should be heated slowly until it has evaporated to the proper consistency. It should be noted that evaporation depends upon the temperature, the surface of the liquid exposed, and the condition of

the air above the liquid. In experiments made by the writers a 30-gallon copper kettle was used. Slow boiling is important in making beet sirup, and several hours will be required to complete the evaporating process. This may be done on the kitchen stove, or a kettle may be suspended in the open, as shown in figure 9, and fire should be maintained sufficiently hot to keep the liquid boiling until the proper amount of evaporation has taken place to produce the desired consistency of sirup. Some people like a thin sirup, while others prefer a thick product. In boiling the juice, care should be taken to avoid burning. A little experience will enable one to accomplish the boiling without scorching the sirup.

SKIMMING.

While the boiling is progressing, a scum will rise on the surface of the liquid; this should be removed carefully by means of a skimmer. An old-fashioned milk skimmer, or a basin with or without small holes in the bottom, will accomplish the desired result. The skimmer should, for convenience, be provided with a suitable handle. A small straight or curved stick of proper length, split at one end and slipped over the edge of the skimmer, will serve the purpose. The object in skimming is to remove the scum as completely as possible without wasting any of the liquid. This operation removes the strong, beetlike flavor and leaves a wholesome and palatable product. The removal of the scum tends also to keep

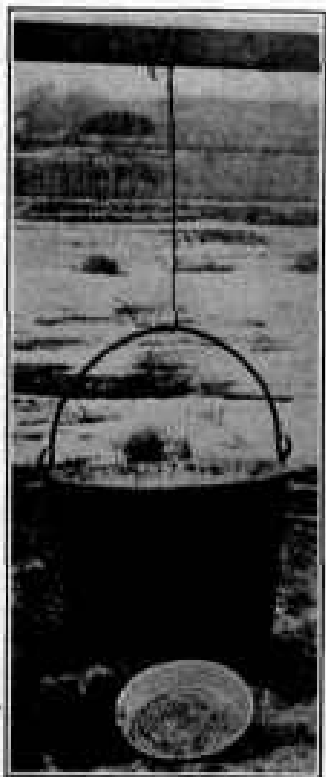


FIG. 9.—Kettle used in demonstrating beet sirup making on the farm.

the liquid from boiling over. As soon as the sirup has reached the desired consistency and has been skimmed carefully it may be placed in cans or bottles for future use. It should be canned or bottled while hot and tightly sealed or corked to prevent molding.

QUALITY OF THE SIRUP.

The sirup produced from beets is dark in color. This would be objectionable if the product were placed on the market, but for home use it probably would not be regarded as serious, in view of the quality of the product and the simplicity of the process. Any method

of bleaching or otherwise removing the dark color would require considerable skill and some outlay of money. The desire being to produce a palatable and nutritious article of food which can be made in almost any home, the writers have aimed to avoid all technical and expensive methods. The flavor of the sirup is pleasant. It contains the pure juice of the beet root and is a wholesome and nutritious food, which to a certain degree should be helpful in reducing the sugar bill.

USES OF BEET SIRUP.

Beet sirup may be used for all purposes for which other sirups or molasses would be employed, especially for table use; for example, on buckwheat cakes, in making dark-colored cake, or in preparing certain kinds of homemade candy. If the evaporation is carried far enough and the sirup is allowed to stand, a dark sugar will settle out. This sugar will be found very satisfactory for home use in cases where refined sugar is not necessary, such as in making pies or dark-colored cake.

