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GROWING CANNERY BEETS

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GROWING CANNERY BEETS
by
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Importance of Crop. Oregon is among the leading states of the Union in the production of beets for canning, ranking about fourth in total tonnage but first of all states in tonnage per acre. The Northwest beet pack is conceded to be of unusually high quality. Beginning in 1919 with a pack of 3,608 cases in Oregon, the pack for 1944 was 1,052,800 cases. The acreage of beets for canning in Oregon in 1944 was estimated at 2,000 acres, or about one-ninth to one-tenth of the total U. S. acreage.

The U. S. pack in 1944 was 7,769,878 cases in tin and glass. In the United States the leading states packing beets are Wisconsin, New York, Michigan, Oregon, New Jersey, Utah, Colorado, and Washington. Out of the pack of over seven million cases for the entire country, 1,207,689 cases were packed in the West.

No beets appear in the list of quick-frozen vegetables.

Climatic Relations. The beet is essentially a cool season crop, growing best under moderate temperatures and fairly high humidity. The quality as well as the color of the roots suffers through the influence of high temperatures and periods of drouth. Roots should grow steadily if not rapidly. Low temperatures in the early spring may cause a premature development of seed stalks during the first instead of the second year. The plants themselves will not suffer in hot weather if there is sufficient soil moisture; however, it is thought that high temperatures do not favor development of the desirable red color of the roots. Dry weather with warm temperatures intermingled with cool and moist days also contributes somewhat to the development of beet canker, which is discussed in future paragraphs. The early crop of beets grown in western Oregon for canning is harvested during a period of rather warm weather, namely, from the middle of July to the first of September, but canning of a later crop may extend into the forepart of the winter. It has been found in field trials that beets harvested and canned in the fall have a better color and quality than those maturing at a warmer season of the year, and it is believed that the decrease in temperature during the later periods of growth may be responsible for a darker color of the root if the beets are harvested during the fall months.

Apparently a decrease in temperature results in an increase in anthocyanin pigments in beets, while high temperatures plus abundant foliage cause the breakdown of anthocyanin pigments.

Soils. Comparatively little data are at hand to show the influence of different soils on the character, quality and color of beets. Cannery men in general are of the opinion that the sandy loam bottom lands are the best for producing good quality roots which are smoother, more uniform and of finer texture and flavor. Experimental work at the Oregon Experiment Station seems to indicate that the lighter, sandy soils are productive of somewhat lighter-colored roots than the heavier types of soil, but this question needs further investigation and substantiation. The Connecticut Agricultural Experiment Station states that different soil

types may be responsible for color differences.

The difference in soil types is reflected largely in the differences of yields in tons per acre and quality of roots. Peat or organic soils are capable of producing a high tonnage, and this is likewise true of sandy or silt loam soils which are irrigable. The smallest yields come from unirrigated upland soils. It is usually easier, moreover, to get a good stand of plants on a free, friable soil of sand, silt loam or peat than it is on one of heavier structure. An important factor of the soil is that it should be comparatively free from weeds, for the crop is intensively cultivated with the rows close together.

The beet plant is sensitive to acidity and if grown on a soil that is more acid than pH 6, liming or the use of an alkaline fertilizer may be advisable.

Fertilizers. Soils for beets should be well balanced in fertility for a good growth of leaves and roots. A 10-ton crop of beets per acre is stated to contain in the roots 52 pounds of nitrogen, 20 pounds of phosphoric acid and 105 pounds of potash. Land manured a year previously is better than that to which manure has recently been applied, even though it is rotted. Fresh manure is undesirable. Cover crops are useful in providing organic matter, and they should be turned under early enough so as to be well rotted before the time of seeding takes place.

In view of the variation in soil types and fertility, no commercial fertilizer can be said to be profitable until it has demonstrated its usefulness by trials on the particular piece of land to which it is applied. However, it is customary to use some commercial fertilizer in growing a crop of cannery beets. Ratios of commercial fertilizer include 1-2-2 and 1-3-3, in which case a 5-10-10, 3-10-10, or a 4-12-12 fertilizer might be adaptable.

If the commercial fertilizer contains no sulfate of ammonia, superphosphate and sulfate of potash, the application of 200 pounds of land plaster per acre, supplying sulfur, would be desirable.

If two to three hundred pounds of the commercial fertilizer together with forty to fifty pounds or so of borax are applied at the time of seeding, they should preferably be placed about two inches away from the seed row and slightly below the seed level. Other forms of commercial fertilizer placement include broadcasting to the extent of 500 to 1,000 pounds per acre several days before planting. In the case of the row treatment, 40 to 50 pounds of borax would be applied per acre, and 50 pounds or more where the commercial fertilizer was broadcasted.

The maximum amount of plant food recommended by the Experiment Station for 1944 was 50 pounds of nitrogen, 75 pounds of phosphorus, and 100 pounds of potassium per acre.

The evidence regarding the effect of fertilizers on the color of roots is somewhat controversial. In Ohio a high phosphorus fertilizer produced the best color and flavor. In other cases, however, only slight differences were observed from variation of environmental factors.

Varieties and Strains of Seed. The Detroit Dark Red is the most widely grown variety for canning. Due to the differences in strains of this variety, however, it is imperative that a high-class strain of the variety be grown. In some strains there are too many light-colored roots, color being a hereditary character transmitted by roots grown for seed. Good strains have comparatively few roots of light color. Some strains are moderate in performance with no extreme colors, neither very light or very dark, but having too much apparent zoning. The best strains show a majority of roots with no zoning. Some strains have a good color of roots, but the shape may be undesirable. The important characters of beets for canning include a comparatively small erect top with a small narrow collar or neck, roots globe-shaped, symmetrical in outline, with a small tap root, a uniform interior color which is not too dark, and zones so inconspicuous that the flesh seems to be of a consistent deep, blood-red color. They should also be of good edible quality and flavor. A high degree of resistance to downy mildew is also an important character of a strain of beets.

Other varieties of beets beside Detroit Dark Red, which have been grown for canning, include Ohio Canner and Asgrow Canner.

Seeding. The time of seeding varies according to the time when the beets are wanted for harvesting. In most cases seeding is done during April through May for delivery in July up to October, and sometimes thereafter. A crop will grow to a desirable size in about 90 days. In areas where the summers are hot and dry it is desirable to have crops ready for harvesting before hot weather. In growing a fall crop the forepart of the growing season may be warm but the crop will mature in cool temperature.

For rows 22 to 24 inches apart, about seven to eight pounds of seed are planted per acre. The size of beet desired to be canned will determine the thickness of seeding.

Beet plants are susceptible to damping off, a fungus disease that may do damage to the young plants even before they appear above ground. Skips of plants in the rows may often be due to the failure of plants to develop because of damping off. Seed treatment is therefore of value in improving the germination, but it is no guarantee of preventing damping off of the seedlings following their emergence through the soil. Ceresan, Arasan and Cuprocid are useful seed-dusting materials. For information on seed treatment, consult Station Circular of Information No. 334 of the Oregon Experiment Station.

Cultivation. The main object of cultivation is weed control as well as putting the soil in a proper state of tilth following rains or irrigation. Soil stirring and weed eradication can be done efficiently when the plants are small. Most commercial fields are weeded and cultivated with a power cultivator.

Irrigation. This is a part of the beet grower's program where the soil is of such a nature as to hold insufficient moisture for the entire season of the crop. Irrigation insures a steady and uniform growth of the plants, a better grade and quality of roots and a higher tonnage per acre. It is possible, too, that the color of the roots may be improved by having a sufficient amount of moisture for their best growth. It is certain that with uniform moisture in the soil there is less danger of heat canker.

Beets are irrigated by both the overhead and the furrow systems. The majority of growers use rotary sprinklers or permanent or portable mist-spray lines. Applications of water usually cover a period of two to three months, namely, from mid-June to the end of August, during which time the equivalent of 10 to 12 inches of rainfall may have been applied. One inch of rainfall-equivalent per ton of beets produced per acre is a common requirement.

Crop Pests. Serious damage to beets has been caused by beet canker, which is fully discussed in Oregon Experiment Station Circular of Information No. 283. This malady of the roots can be controlled to some degree by the application of approximately 50 pounds or so of borax per acre, the mesh of borax and the amount depending on the manner in which the material is applied as discussed in the circular named.

In some areas of the United States where beets are grown for canning, borax sprays applied in the summer have been used to supplement an initial application of borax at the time of seeding and have been found helpful in reducing damage by the black-spot disease or canker of canning beets. In these instances it was ascertained that even fairly heavy broadcastings of borax or side row applications at seeding time were not always adequate to control the disease, particularly if dry spells during the growing season were followed by rains, causing increased boron requirements for the beet plants; hence, the use of mid-summer sprays with a borax solution, using approximately $7\frac{1}{2}$ pounds of borax per 50 gallons of water and a total amount of 150 - 200 gallons of spray to the acre. There should be a uniform coverage of the beet leaves. High pressure spray rigs are unnecessary.

There are comparatively few insects that do damage to beets, although flea beetles may attack the young plants soon after they are through the ground. They may be controlled by dusting with rotenone or cryolite. Later when the plants are growing rapidly, the flea beetles will do little, if any, damage. See Extension Bulletin 551, "Vegetable Insect Pest Control."

In certain parts of the state where curly top may exist, beets grown for canning in those areas may be seriously affected. Investigations are being made at the present time looking to the control of the beet-leaf hoppers causing curly top, which may possibly be accomplished by breeding varieties of table beets resistant to the hoppers.

A serious disease of the beet is downy mildew, the presence of which in beet fields during the past few years has sometimes assumed considerable proportions. The disease manifests itself on the older leaves of the plants by isolated spots of irregular shape ranging in size from $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches in diameter. These spots are differentiated from the healthy tissue by the lighter green color of the upper surface of the leaves and by the heavy coating of mildew on the lower surface. During periods of extremely low humidity these spots on the beet leaves are sometimes surrounded by a narrow ring of pale red pigment. In the fall after a period of heavy rainfall, all affected new leaves are small, thick and often curled downward at the edges, having in most cases a light green color.

From investigations made by research workers it is evident that this disease is carried in the roots which are pitted in the field to be saved for seed production the following year. There is also considerable evidence indicating that downy

mildew is transmitted with seed. Some strains of beets have been developed which are highly resistant to this disease, and therefore if these strains have desirable characters for canning they should be grown in preference to others.

Premature Seeding. Beets will sometimes produce a seedstalk the first year instead of a root if the plants grow continuously under a temperature as low as 50° to 60° F. In warmer temperatures very few, if any, of the plants will shoot a seedstalk.

Harvesting. When the roots have reached the desirable size for delivery to the cannery, they are harvested either by machinery which digs, tops and delivers the roots into trucks or the roots are pulled, topped and sacked by hand.

Beets for canning are usually graded into three sizes: No. 1, 1-2 inches; No. 2, 2-3 inches; No. 3, 3-4 inches.

Yields. Tonnage of beets per acre varies considerably according to the type of soil, fertility and moisture available. In recent years a 10-year average for the United States was a little over 6 tons per acre, with Oregon yielding between 10 and 11 tons per acre. Individual plantings frequently exceed this figure. In fields where the yields are below normal this condition has usually occurred due to a poor selection of soil, inferior stand of plants, too many weeds, lack of sufficient soil fertilization, and possibly a considerable portion of the roots affected with canker.

Minimum 1945 prices per ton to the grower by grade delivered at the processing plant are \$28, \$21 and \$12 respectively.

The gross weight of roots required for a packed case of 24 cans averages about 38 pounds or at the rate of 52 cases per ton.