

Beets for Sugar and Alcohol Production

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Sugarbeets (*Beta vulgaris*, L.) are usually grown in Michigan for sugar production under contract with a sugar company. There is also an interest in growing small acreages of beets for alcohol production, and this bulletin is written with that in mind. However, the principles outlined here apply to both situations.

In this bulletin the term *sugarbeets* is used to describe those types of beets which have been selected for high sugar content and are grown for sugar production. The term *beets* is a more general term describing sugarbeets, fodder beets and other beet types.

Soil Requirements and Land Preparation

Beets can be grown on mineral soils ranging from loamy sands to clays and on organic soils. On loamy sands and sandy loams, irrigation may be required to obtain top yields. Due to poor processing quality, sugarbeets are seldom grown on organic soils. Sugarbeets can be grown in all areas of Michigan because they are tolerant of frost in the fall.

Planting should be done as early as possible. Usually sugarbeets are planted about the same time as oats. In the southern half of lower Michigan, April 15 to 20 is a good starting period. Farther north this date will usually have to be delayed somewhat.

If planting is delayed as late as June 1, reasonably good yields can still be obtained. Later planting has some hazards such as difficulty in obtaining a stand due to damping off disease and greater competition from weeds when beets are in the seedling stage. Herbicides, if used, may not be as effective with later plantings.

Emergence is usually best if the soil is plowed and worked once lightly ahead of planting. On fine-textured soils, it is usually best to fall plow; on coarser-textured soils spring plowing will be advantageous. Plowing should be as deep as practical, usually 8 to 12 inches deep. Avoid turning up large amounts of subsoil.

Planting Management

Plant sugarbeet seed $\frac{3}{4}$ to $1\frac{1}{4}$ inches deep for maximum germination and emergence. Corn planters are usually used for planting sugarbeets. Special seed plates

and/or attachments are needed for planting beet seed. Consult your implement dealer for detailed information. Used equipment may be available from dealers in the sugarbeet growing regions of the state. For those desiring to plant a small area, hand row planters are available which work satisfactorily.

Commercial growers plant sugarbeets at 6 to 8-inch spacing between seeds in the row. When growing beets for the first time, it is recommended that a 2 to 3-inch spacing be used with subsequent thinning of stand to an 8-inch spacing. At a 3-inch spacing in 28-inch rows, it will take 1.5 to 2.5 pounds of seed per acre, depending on seed size.

Row width is governed by spacing used on other crops. Beans and corn are usually grown in 28 to 30-inch rows. Sugarbeet yields can be increased 10-15 percent by reducing row width to 20 to 22 inches. Convenience and cost of equipment dictate which row spacing is generally used.

Varieties

Grow varieties adapted to Michigan. Reports are frequently available from other locations of some varieties yielding well or having a high sugar content, but if these varieties have not been tested under Michigan conditions, there is no assurance similar results would be obtained here. Susceptibility to disease can quickly mask any apparent advantage shown elsewhere.

Soil Testing and Fertilizer Recommendations

The amount of fertilizer needed is best determined by a soil test. For information on securing a soil sample, see Extension Bulletin E-498, "Sampling Soils for Fertilizer and Lime Recommendations" (free). In the absence of a soil test, apply 60-80 pounds of nitrogen (N), 75 pounds of phosphate (P_2O_5) and 150 pounds of potash (K_2O) per acre.

Best results are obtained if at least one-third of the fertilizer is banded to the side and below the seed. Boron and manganese may be needed if the soil pH is above 6.8. See Extension Bulletin E-550, "Fertilizer Recommendations for Vegetables and Field Crops" (65 cents, for sale only) for further information.

Disease, Insect and Nematode Control

Many diseases can affect beets. Disease control is best

handled by selection of varieties and rotation of crops. Beets should not be grown any more frequently than every three or four years. Excellent preceding crops are corn and small grains.

Legumes grown in the intervening years are good for soil structure, but should not immediately precede sugarbeets. Rhizoctonia root disease can be reduced by rotation and care in cultivation. Don't move soil over onto stems or crowns of the beet plants. Leaf spot resistant varieties are essential in Michigan.

The primary insects which affect sugarbeets are cutworm, flea beetle and spinach leaf miner. Others are wireworm, white grub, aphids, tarnished plant bug, blister beetle and grasshopper. Monitoring of fields is important because populations can increase rapidly and cause damage quickly. When beets are in the seedling stage, insect damage can be very critical.

Another pest which affects beets is sugarbeet cyst nematode. Prevention is easier than the cure. Long rotations (three or more years) reduce the chance of building up populations of this pest. Don't dump trash from sugarbeet plants on your sugarbeet fields.

Nematodes cause beets to wilt or have nutrient deficiency symptoms due to root damage. Seedlings die and surviving beets are small and have excessive hairlike roots. Soil samples analyzed for nematodes will confirm their presence.

Several pesticides are available to control insects and nematodes. Consult your sugar company representative, county Extension agent or chemical dealer for further information. Also see Extension Bulletin E-1195 "Protecting Sugarbeets from Insects and Nematodes" (35 cents).

Weed Control

Weed control in sugarbeets is important because of yield loss and because weeds harbor insects and serve as an alternate host for many diseases and cyst nematodes.

There are several options open to the sugarbeet grower for weed control. Preplant incorporated, pre-emergence and post-emergence herbicides are three groups of chemical controls available. In addition, cultivation, hand labor and mechanical clipping of tall weeds aid in weed control. Recommended herbicide programs are outlined in Extension Bulletin E-434, "Weed Control in Field Crops" (40 cents).

Herbicides applied on other crops in the rotation may leave residues which adversely affect beets. Atrazine (Aatrex) applied to corn prior to beets has caused problems on beets. Herbicides other than atrazine are sug-

gested for corn prior to beets. Treflan, Cobex and Tolban applied to beans the previous year may cause loss of stand and twisting of roots. When these materials are used the year prior to beets, use the lowest recommended rate and moldboard plow prior to planting beets.

Beets for Alcohol Production

Sugarbeets are an attractive source for alcohol production because of their high fermentable sugar content. Commercial production of alcohol from sugarbeets is not economically competitive with the production of sugar at present prices. However, there is interest in using beets in on-the-farm stills. While the relative economics of beets versus other crops is not clear, it is thought that beets would serve as an additional source rather than the only source of fermentable material.

Fodder beets, developed in Europe for cattle feed, yield more in that area than recommended varieties do here. However, this is not a side by side comparison. Those beet types are known to be susceptible to many diseases present in Michigan.

Results have shown that recommended sugarbeet varieties produce more fermentable sugar than other beet types. Consequently, beet types other than sugarbeets are not recommended for alcohol production. Efforts are presently underway to develop the fodder type of sugarbeet with the disease resistance required for Michigan conditions.

Beets can be chopped with a forage chopper. A source of water will probably be required to keep the machinery clean.

Harvesting and Storage

There are several alternatives for harvesting beets. First, for those who wish to make the investment, harvesters are available from machinery companies. Second, beet lifters can be used, but may not be readily available. Third, level bed potato diggers may be used. This method may slice the root and leave a portion in the ground. Fourth, beets can be hand dug with a tiling spade or shovel.

When storing sugarbeets on the farm for more than a day or two, the average daily temperature should be below 50°F. The storage area should be a hard surface free of stones and other trash because these would damage equipment. Beets would probably be dug on an "as needed" basis for the small alcohol producing facility.

Storage of sugarbeets for commercial sugar production is handled by the sugarbeet company.

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