

Table Beet, Spinach, Swiss Chard, and Mangel

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BEET

Beet seed is occasionally produced by the transplant method. Recently most of the table beet seed has been produced satisfactorily on a seed-to-seed basis. Seedsmen have two objections to seed-to-seed production: (1) lack of winter hardiness of the table beet plants; and (2) lack of opportunity to discard off-type roots (as is the case with the transplant method). A carefully coordinated arrangement that takes advantage of the best parts of both methods should be used.

One thing which restricts table beet seed production in eastern Oregon is the prevalence of the Curly Top disease; in the Willamette Valley, it is the prevalence of sugar beet seed fields. Many other problems exist in connection with growing and handling this crop.

Producing and storing roots

Table beet roots should be grown in about the same manner as beets produced for processing or fresh market. Deep, friable loam or sandy loam soils are preferred since these soils allow growth of well-formed roots and aid in their subsequent handling. Irrigation is essential in order to put the soil in proper condition for planting and to keep the roots growing steadily.

Prior to planting, boron at the rate of $1\frac{1}{2}$ to 2 pounds per acre should be broadcast and worked into the soil in order to prevent beet canker.

The best roots for seed production are grown from seed sown by early June. Seed is sown at the rate of 8 to 10 pounds per acre in rows spaced 16 to 20 inches apart. Medium-sized roots require less storage space and handling costs as compared to larger roots. If table beet seed is produced by the more hazardous seed-to-seed method, planting can be delayed until mid-August.

With the transplant method, the beets are lifted and topped late in the fall before danger of heavy frosts. Care should be exercised to avoid bruising the roots or injuring the stem plate from which new growth will arise. Some growers accomplish the topping process easily and effectively by running a mowing machine over the field prior to digging.

Store roots by one of two methods: (1) in sheds, with controlled temperature conditions; and (2) in the field, where outdoor temperatures must be considered.

With shed storage the roots are placed in crates, stacked in tiers, and held at 40 degrees F. Sanitary precautions are similar to those for carrot roots.

With field storage one of several methods can be used, but none is completely satisfactory. One method of handling the roots is to place them in pits and pile them to a height of 2 feet or more above the ground. A heavy layer of straw or loose shavings is placed over the roots, and soil is added as the weather becomes colder. Such pits must be on high, well-drained sites with adequate drainage. Ventilation is provided by straw chimneys. Considerable loss occurs from rot organisms during mild winters. Another method is to pull and place the beets on the top of the ground in long windrows. Two rows are laid together with the tops being placed outward and the row is then covered with a few inches of soil. Still another method is the nonventilated-type pit which is being used successfully by British Columbia seed growers. With this method, a long, narrow furrow is excavated and roots are piled in to a depth of 18 inches or so. Soil is then plowed over the roots before heavy frosts to provide winter protection. Site should be high and very well drained.

Producing the seed

In the spring when the roots called "stecklings" or "bulbs" are removed from the pits, all diseased and off-type roots should be discarded. Late March and early April plantings are preferred.

Because of the high positive correlation between size of root and seed yield, it is desirable that more root tissue develop after the roots are transplanted.

Specialized transplanting machines similar to the ones used for planting cabbage are used to set out the roots. The roots should be placed in an upright position in rows spaced 3 to $3\frac{1}{2}$ feet apart and spaced 1 to $1\frac{1}{2}$ feet apart in the row, depending upon the size of the roots. The crown should be set at about the depth at which it grew or a little deeper. If the ground is inclined to crust, care should be taken not to cover the crown too deeply. Firm the soil around the roots following transplanting; rain or irrigation helps.

Sidedress 50 to 60 pounds of nitrogen and 80 to 100 pounds of P_2O_5 in bands after the roots are set out. After the beet plants have bolted and flowered, broadcast a little additional nitrogen. Beets will not make optimum growth where soil reaction is pH 5.5 or below.

Particular attention should be given to adequate weed-control practices in the early stages of plant development because the control of weeds by mechanical means in the later stages is impossible without injury



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to the plants. Often it is necessary to hoe in order to eliminate late-growing weeds.

During early bloom stage, beet fields should be checked for lygus bug infestations.

Harvesting the seed

Beets are considered ready for harvest when the base of the stalks and branches are quite brown, when the seed in the middle portion of the stalk is in the hard-dough stage, and when the seed at the tips is still somewhat immature. Delaying the cutting operation beyond this stage results in considerable loss by shattering. Seed stalks of table beets are prostrate. Where hand labor is expensive or not available, stalks are cut with a swather. The stalks remain in windrows for curing. Plants having roots attached should be removed from the windrow before threshing. When dry, the plants can be threshed easily with any good grain combine or stationary thresher. With either method it is necessary to reduce the cylinder speed and wind blast and to open the concaves sufficiently to prevent hulling.

Seed yields range from 800 to 2,000 pounds per acre. Yields nearly twice as high have been reported, however. Where roots have been carefully stored over winter and properly set out in good soil, yields of around 1,000 pounds per acre normally can be expected.

SPINACH

Spinach is one of the cool-season crops well adapted to seed production in the Willamette Valley. It is quite hardy, having the ability to withstand temperatures of 10 to 15 degrees F. below freezing. Hybrid and open-pollinated seeds are produced in western Oregon.

Although spinach is classified as a biennial, it will produce seed the first season under Oregon conditions. This crop can be planted either in the fall or early spring. Fall seedings are made in September. Spring seedings are made in March or early April. The object of early spring planting is to grow good-sized plants capable of high seed yield before the long days of summer cause bolting. Germination is usually not a problem with early plantings. Spinach seed will germinate satisfactorily with soil temperatures as low as 40 degrees F. Soils selected for growing spinach seed should be near neutral in reaction, extremely fertile, and well supplied with moisture and organic matter. The seed is usually sown in rows spaced 18 to 24 inches apart at the rate of 6 to 8 pounds per acre.

A complete fertilizer should be broadcast and disced in before seeding or banded at the time of seeding. A total of 75 to 150 pounds of nitrogen is needed to produce high seed yields under irrigated conditions. Excessive rates of nitrogen (225 pounds per acre) cause lodging and delay in seed maturity. Phosphorus and potassium, in combination with nitrogen, are beneficial only in the very early stages of growth.

Spinach produces both male and female plants and only the latter type produces seed. For hybrids and certain strains it is necessary to rogue in order to elimi-

nate off-type plants. The first roguing should be done before the plants bolt because it is easy to differentiate between types at the rosette stage of development. Later roguing may be necessary.

Two methods of harvest prevail in the Willamette Valley. One is to let the plants ripen fully while standing until the seed is dry—then harvest with a combine. Bird damage and losses by shattering are problems with this method, however. The preferred method is to cut and windrow the crop after the latest ripening plants have started to turn yellow. Let them cure in the field and then thresh.

Varieties vary greatly in yielding ability in western Oregon. Average seed yield is 500 to 800 pounds per acre, but under good soil and climatic conditions more than 2,000 pounds per acre have been obtained.

SWISS CHARD

Swiss chard has been grown successfully for seed production purposes in the Willamette Valley. This crop crosses readily with other members of the beet group, and particular attention must be given to isolating the plants from fields of sugar and table beets.

In the Willamette Valley, both the transplant and the seed-to-seed methods have been used successfully. When grown by the transplant method, the root bed is established in about the same manner as that described for table beets. The seed is planted by the middle of June and the plants are left in the field rather than stored. In the spring the roots are plowed out and transplanted in the same manner as described for beet roots.

When grown by the seed-to-seed method, chard is handled in the same way as table beets. Plantings may be made any time during midsummer provided irrigation is available. If irrigation facilities are not available, seedings made before the end of May will usually produce enough growth by fall. Irrigation is not essential, but it contributes to profitable yields.

One of the big problems with chard is that of harvest. Well-grown chard seed crops resemble sugar beet seed crops in that the plants are 7 to 8 feet tall and are tangled together. The sugar beet seed harvester, a specially built windrower equipped with two cutter bars, is ideal for chard seed harvest. After curing in the swath, the seed can be threshed with any good combine with a pickup attachment. Seed yields for chard have been quite high with an average of 1,000 pounds per acre and better yields around 2,000 pounds.

MANGEL

Mangels have been grown successfully for seed in western Oregon. This crop is very similar to sugar beets and swiss chard in general cultural and handling requirements, procedures, and seed yields. Excellent yields are often attained under dryland conditions because of the ability of the mangel root to draw on moisture reserves at the lower soil depths. Cultivation and harvest equipment suitable for sugar beets and swiss chard generally can be adapted for the production of mangel seed.