

or vegetative propagation from single plants of special interest. By this method it has been possible to root and grow many plants of identical genetic constitution. Vigorous and succulent cuttings from branches of vegetative seedstalks are considered better than vegetative buds cut from the crowns of mother beets. Physiological considerations are particularly important, however, in connection with the successful production of these vegetative seedstalks. First, a vigorous seedstalk must be produced in a bolting environment, under a low temperature and long daily photoperiod, but before this seedstalk develops too far it must be thrown vegetative or semi-vegetative in a non-bolting environment, under a warm temperature and short daily photoperiod.

With cuttings of proper vigor and size, the problem of rooting them in a cutting bed is not different from the problem of rooting cuttings from many other species of plants familiar to horticulturists and gardeners. When these plants of identical genetic constitution are made available their usefulness in providing uniform genetic material for physiological and genetic problems is quite obvious. They can also be utilized in a practical plant-breeding program to excellent advantage.

GROWING OF SUGAR BEETS IN HILLS FREE FROM COMPETITION

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One of the difficulties, in selection of sugar beets for breeding purposes, is the obtaining of roots which have had equal growth conditions. Commercial sugar beets are normally grown in rows 20 inches apart and spread 12 inches within the rows. Very often missing hills occur which will give an advantage to beets adjacent to the missing spaces. For a number of years, the majority of the sugar beet selection work has been done by selecting beets which were completely surrounded by evenly spaced beets and attempting to avoid beets which were adjacent to missing hills. Such beets were termed normally competitive beets. Several investigators have not considered the normally competitive beet wholly accurate but it is a means of selecting beets more uniform than can be selected if no consideration is given to adjacent missing spaces in commercial plantings.

With small amounts of seed grown from isolated plants, it is sometimes, impossible to obtain a sufficient number of competitive beets, to judge accurately the value of the strain. This is due to the small amount of seed or poor germination which is often found in inbred or isolated plants.

In 1936, three men of the Office of Sugar Plants, each working separately in different field stations, attempted to grow some sugar beets free from competition so as to evaluate the productive ability of different strains of beets. S. B. Nuckols had, at this time, collected some data and prepared a manuscript which cast additional doubt upon the accuracy of the normal competitive beet method of selection. With slightly different purposes in view, the three men of this division, planted beets in hills and spaced them to a distance apart, which would either partly or totally eliminate the competitive effect of adjacent hills and also eliminate the loss of numerous plants which were previously discarded due to missing hills.

Mr. Nuckols and John Gaskill, each, used 40-inch distances between the hills in all directions while Mr. Stewart used 30-inch intervals. The harvested results were sufficiently different, from the results obtained by normal procedure of growing breeding plots, to warrant the presentation of these data upon the growing of sugar beets free from competition.

CONCLUSIONS

1. The planting of sugar beets in hills 40 inches apart is valuable in the growing of sugar beet selections for mother beets, as it enables one to produce a greater number of mother beets from a small amount of seed.
2. The beets grown in wide spacing are larger and produce more seed than competitive beets. In some instances more than 2 pounds of seed has been grown from 1 beet.
3. These large beets can be divided into four or more parts which makes possible various open pollination crosses (the seed beets saved in 1937 average over 12 pounds in weight).
4. The beets are free from competition one with another and beets adjacent to missing spaces are not increased in size, therefore, any beets grown can be accurately judged as to weight.
5. The hill planted beets will vary more in weight than similar beets planted in the 12 x 20 inch spacing.
6. The sucrose content of hill planted beets is slightly lower than that of commercial plantings, however, the variation between strains is no greater than that for the same strains planted in 12 x 20 inches and in majority of instances, the higher sucrose percentage strains or the lower sucrose percentage strains are identical in both types of planting.
7. The hill planted beets do not produce as great a proportion of leaves in proportion to root as do the same strains in 12 x 20 inch planting.
8. As few as 30 hills of beets have been found to give a reasonably accurate estimation of the value of a strain of beets.
9. Sugar beet breeding work will be expedited by the use of this additional method of production of mother beets; however, the competitive method will continue as a necessary part of the procedure.

WIDE SPACING AS AN AID IN SELECTION

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Thirty two strains of sugar beets, largely of leaf-spot resistant type, were grown in 1937 under conditions of normal (10" x 20") and wide (40" x 40") spacing, in adjoining areas, with 8 replications in each spacing. All data taken from the normally-spaced plots were based on fully competitive beets, but since competition was effectively eliminated by 40" x 40" arrangement, it was not necessary to consider skips in the latter set of plots.