

storage. In the spring, the selected beets of each variety are transplanted in space isolated groups for seed production. Seed obtained from these groups constitutes breeders stock of new selections.

### Inbreeding

Since all roots selected for new breeders stocks are carried in pedigree record, inbred lines are begun from selected roots by placing one or more kraft bags on branches of the plant prior to flowering. Seed obtained from these plants, as well as seed from inbred lines produced in field and greenhouses are planted in three inch pots in the greenhouses in April. Normally, only the small seed lots are thus planted. In May, these plants are removed to the field, and at that time inbreds having large seed lots are planted directly in the field. During the summer this nursery is subjected to periodic night sprinkling from an overhead sprinkler, for the purpose of inducing a leaf-spot epidemic. Usually not more than ten percent of the inbred progenies planted are found to be satisfactory in resistance to the disease. Roots of these selected lines are either used for greenhouse planting, or stored and replanted in the field for further breeding work.

Roots of inbreds obtained from field selections, as well as stecklinge produced from inbred seed in the greenhouses are transplanted to the field each spring, where all are subjected to further inbreeding. Some of the more uniform lines are crossed (using bags) for the production of natural single crosses. In the event that certain of these hybrid combinations appear to be of promise, the seed supplies of the parent inbreds are increased for possible large scale production of hybrid varieties.

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### A STUDY OF SUGAR BEET HYBRIDS

H. W. Dahlberg 1/

Since the year 1934, many studies have been made of various wild types of Beta Maritima by our organization, with repeated selections of the most promising types. In view of the fact that these wild types show such great variability, description of them is left to showing a series of lantern slides. (Most of the slides shown were used in connection with a later discussion of the crosses and back crosses between wild types and certain Great Western breeding material).

Considerable optimism is required to persevere in a breeding program which includes many lines of hybrid families. The first generation hybrids are nearly always disappointing in both size and type of roots, these being small, scrawny and very much sprangled. While sugar content and purity are fair, both are generally definitely lower than for commercial beets. The following are typical for 1st generation hybrids between wild Beta Maritima and Great Western families.

Weight of root	-	6 to 10 ozs.
Polarization	-	11 to 14 percent
Purity	-	77 to 84 percent

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At the first annual meeting of this Society held in Salt Lake City in 1938, information was presented by the author 2/ on a particular hybrid and the first back cross of the hybrid, which seemed to indicate a type which was rather superior to those usually obtained. The hybrid seed was produced in 1935, by crossing roots of three North Sea wilds with two roots of a Great Western variety. The seed was grown in the author's garden, and the two lots of seed gathered from the Great Western mother plants were called Dahlberg #3 and Dahlberg #4 respectively.

These two lots of seed were grown for observation at Fort Morgan in 1936, the plants showing unmistakable hybrid character, strong vigor, and good resistance to leafspot. A selection was made from these F<sub>1</sub> roots and 29 of them were backcrossed with a corresponding number of sugar beet roots (G.W. family 12028) in the greenhouse during the winter 1936-37, giving rise to breeding group E. 2136. Seed from this first backcross was planted on a large scale for observation in 1937 and continued to show very good performance.

In 1938, a new backcross was made between Dahlberg #4 and G.W. 3642 resulting in breeding group E. 538. In 1939, this backcross was tested in comparison with the Great Western standard variety, with gratifying results as shown in the following comparison:

	Yield	% Sugar	Total Sugar	Tons Per A.	Polarization
Great Western Standard	100.00	100.00	100.00	14.93	17.16
3462x Dahlberg #4	103.62	96.27	99.75	15.47	16.52
Dahlberg #4x3462	104.82	95.92	100.55	15.65	16.46

Since these figures represent mixed seed from 14 families in each case, it is evident that there would be some individual families which show a definitely better performance than the average. Since the Great Western standard variety used in these comparisons has demonstrated itself as a yield type of high performance under a widespread set of conditions, it is gratifying to have a number of lines containing wild blood which promise to exceed the standard in tonnage. These lines are also desirable in that they have very good leafspot resistance, and under leafspot conditions should show an even better performance. The root type of these lines is entirely satisfactory from the commercial standpoint.

In addition to the backcross described above, our organization now has several hundred families which are the result of the second backcross between hybrids and Great Western families. These are being rapidly tested for performance, as we believe that many of them will show promise as commercial varieties. These hybrid families are characterized by large vigorous tops, a rather shiny leaf, and well shaped long roots.

Up to the present time we have found the North Sea type of Beta Maritima to be the best starting point for introducing wild blood into our lines. In the course of the next two years we will have more tests on hybrids resulting from other wild types originating on the Atlantic coasts of Europe, and it is possible that some of these will equal our present North Sea hybrids. We are well satisfied regarding the advantages which may come by introducing additional genes into the present types of sugar beets which probably have resulted from a narrow base of selection.

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2/ Dahlberg, H. W. SOME OBSERVATIONS ON WILD BEETS (BETA MARITIMA).  
 PROCEEDINGS: AMERICAN SOCIETY OF SUGAR BEET TECHNOLOGISTS. Page 76. 1938.