

NEET BREEDING.

Root Generation.

A considerable number of inbred lines were advanced another generation. A few of these lines are probably of genetic interest only; among which may be mentioned the following which are now probably homozygous for one or more characters, or which appear to be approaching homozygosity: 1. A very leathery, smooth leaf with more or less red bordering the veins of the heart leaves. 2. A line with fasciated petioles. 3. "Sticky Leaf", a line in which the leaf surfaces grow together. 4. Dark orange root color. This character appears to have been obtained entirely pure for the first time in 1940. 5. Red root color with slightly red striped petioles and green leaves. This combination while not yet homozygous in the 1940 line will eventually be purified since the 1940 crop had no dark foliage plants, but was still heterozygous for root color. It remains only to select a true breeding red parent root from the line. 6. A line with light yellow root color. For the first time, the 1940 row of this line indicated that such a line may be attained, there were no pure white roots in the row, but the yellow color varied from a pale cream color to a light orange. 7. A line with a very smooth, parsnip shaped root.

First generations of several crosses of genetic interests were grown and known hybrid roots obtained for the production of seed for a second generation. Among these are the following from which known hybrids roots were saved.

1. White root, pink hypocotyl X dark orange root.
2. Orange root X dark red root.
3. Green hypocotyl X pink hypocotyl.
4. Vigorous leaf spot resistant (?) X weak leaf spot susceptible.
5. Normal leaf, green hypocotyl X fasciated petiole, pink crown and hypocotyl.
6. White root, green hypocotyl X light foliage, red root.

A few rows of the second generation of the cross Rocky Ford Red Leaf (white root) X Normal red leaf (dark red root) were planted for observation. The hybrid is the result of the interplanting of a considerable number of roots of each line for the production of a dark foliage beet for use as a marker for plots and it is not definitely known if the Red Leaf white root parent roots were all homozygous for the foliage color character. It was evident during the growing season that plants very closely resembling each of the parents were present in the second generation population. Harvest was delayed in the hope that the cool weather of late fall would cause an intensification of foliage color differences and the planting was caught by a heavy frost which made it impossible to classify foliage classes with any degree of accuracy. Five plants were found that appeared to be normal green for foliage color with pink hypocotyl and white roots. These were probably due to the inclusion among the parent roots of the Rocky Ford Red Leaf strain of a few roots which were heterozygous for normal vs. red leaf. Observation indicated that the peculiar crinkling of the leaf of the Rocky Ford Red Leaf is probably a dominant character and that the Red Leaf ^{red}₁ may be more or less dominant to normal red of the leaves. These observations are in accord with the appearance of the first generation plants. The red roots varied in skin color from light to dark red and in flesh color from near white to dark red. The root color counts were 1990 red and 704 white. This at least suggests a simple 3 : 1 ratio.

Seed Generation. Isolations.

A large number of the inbred lines were advanced a generation by isolation plantings. Many of the lines which had been inbred two to four generations were planted as 2 to 5 root groups for sib pollination instead of the isolation of a single best of the line. In general, the seed production of the isolation plantings of single roots and the small groups for sib pollination was very good as shown by the following summary.

<u>Seed production</u>	<u>Percent of all Isolations.</u>
No Seed (all causes)	9.3%
Few seeds to 2 grams seed	6.2%
3 to 50 grams seed	36.3%
Over 50 grams seed	48.2%

In the past (during the early years of selfing) little or no seed of any line has been held in reserve. It is believed that as these lines approach homozygosity and are tested by means of the top cross or some other method that it would be well to maintain reserve seed of them. It is evident from the above table that sufficient seed for current plantings and a reserve stock was obtained from over half of the 1940 isolations.

Many of the lines of which sib plantings were made appear to be homozygous for the vegetative characters of the seed stalks and seed balls.

Seed was produced from several group plantings of selections and hybrids including eleven lots representing divergent lines of selection from a highly heterozygous basic population.

Seed Production: Bagging Plot.

The bagging plot was again located on Dale Creek at an elevation of over 7,000 feet, and a distance from headquarters of 35 miles. Conditions for the production of beet seed at this location by the bagging method appear to be as good or better than in the immediate vicinity of Fort Collins. However, the principal advantage in the use of this location is the distribution of labor. At Fort Collins, seed stalks develop earlier and blooming starts in late May and continues through most of June. This is the period of thinning, cultivation and preparation for the first irrigation of the main beet experiment field. At the Dale Creek location, the mother beets are planted after isolation and group plantings are finished, usually about the first of May, and blooming starts late in June, with the main period of bloom from about July 5 to July 25. At this time of the summer, the main field requires little attention and the seed plantings at lower elevations are not yet ready for harvest; full time can be devoted to a careful job of bagging. The beets at the Dale Creek location come into bloom more uniformly and produce a considerable number of seed stalks of about equal size; a type of growth which is much more convenient to bag than when one large seed stalk with many side branches is produced. The single seed stalk type of growth is much more common in the plantings at lower elevations.

512 roots were planted for bagging. There was an unusually heavy loss from rotting of the beets, 145 failing to grow. It is believed that a considerable part of this loss was due to too deep covering of the crowns by the cultivator in ditching the plot for irrigation. 11 additional plants were trotzers or very weak and had no bags placed on them. A total of 356 plants had from 1 to about 15 bags placed on them; usually 5 to 12 bags depending on the size of the plant and type of growth. Only one or two bags per plant were used on some very weak or late plants, with very little seed obtained in most such cases. In general, very good seed sets were obtained, much better than any obtained previously. A summary of seed production is given in the following table:

<u>Amount of Seed</u>	<u>from</u>	<u>No. of Plants.</u>
No seed (156 dead & trotzers included)		191
Few Seeds (less than 1 gram)		76
1 to 2 grams		98
3 to 5 grams		71
Over 5 grams		76