

THE DRASTIC RESELECTION OF SUGAR BEETS UNDER SEVERE CURLY-TOP  
EXPOSURES AND THE EFFECT UPON SUBSEQUENT YIELDING ABILITY  
AND SUGAR CONTENT

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Severe injury to sugar-beet crops from the curly-top disease has become uncommon since the widespread use of the varieties U.S. 22 and U.S. 22/2\*. A new and still more highly resistant variety, designated U.S. 22/3, is now being propagated for commercial use. However, none of these varieties are completely immune and they can all be infected under unusually severe exposures to curly top. The varieties U.S. 22, U.S. 22/2, and U.S. 22/3 have all been yield types. A beet with a higher sugar content would be desirable. U.S. 33 is a higher sugar type but it lacks sufficient curly-top resistance in areas where curly-top is bad. The new high-sugar variety, U.S. 35, is now under consideration for commercial use. In curly-top resistance U.S. 35 is superior to U.S. 33 or U.S. 22 but is slightly inferior to U.S. 22/2.

To combine the highest possible curly-top resistance with a higher sugar content, the breeding work during the past four years has been centered largely around the two varieties U.S. 35 and U.S. 22/3. Several angles of approach have been used, including hybrids between the two varieties. The present report deals with reselections for increased curly-top resistance by the method\*\* of planting in midsummer under artificial curly-top epidemics. By this method, drastic disease exposures were produced which made possible the elimination of the less resistant individual beets. In each case these selections led to improved curly-top resistance. The chief interest here is the resulting effect on yielding capacity and sugar content.

Selections were made from the varieties U.S. 35 and U.S. 22/3 under artificially produced curly-top epidemics at Jerome, Idaho. Because the time of planting was delayed the beets selected were too small for satisfactory sugar tests, so disease resistance and the size and shape of the root became the sole criteria for selection. The percentage of beets eliminated by curly top in each case represented approximately 99 percent of the plant population. This was a high elimination of the less resistant individuals, and in case of correlated inheritance it might easily affect yielding capacity, sugar content, or other characters. It was assumed that the yielding capacity might be increased with a corresponding decrease in sugar percentage.

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\* Eubanks Carsner and F. V. Owen, Saving Our Sugar Beets, U. S. Department of Agriculture Yearbook of Agriculture, pp. 358-363, 1947.

\*\* Murphy, Albert M., 1942. Production of heavy curly-top exposures in sugar beet breeding fields. Proc. Amer. Soc. Sugar Beet Tech. 459-462.

Tabulated data from agronomic tests made under relatively curly-top free conditions are as follows:

Reselections under severe curly top compared with parental variety for yield and sugar percentage.

Location of test	Parental variety	Rese- lected strain	Tons per acre		Sugar percentage	
			Rese- lected strain	Increase over parent	Rese- lected strain	Increase over parent
Granger, Utah, 1939	US 33 (SL 833)	SL 876	30.30	+4.66**	16.88	-.69*
Granger, Utah, 1945	US 22/3 (SL 32)	SL 42	32.06	- .05	15.23	+.11
Granger, Utah, 1946	DO.	SL 52	31.06	- .83	13.51	-.09
Granger, Utah, 1946	DO.	SL 51	31.55	- .34	13.28	-.32
Jerome, Idaho, 1945	DO.	SL 42	18.84	+ .72	16.88	+.42
Jerome, Idaho 1946	DO.	SL 52	19.78	+1.37	16.76	+.49*
Jerome, Idaho, 1946	DO.	SL 51	19.89	+1.48	16.42	+.15
Granger, Utah, 1946	US 35 (SL 54)	SL 55	28.50	- .51	14.77	-.42
Twin Falls, Idaho, 1946	DO.	SL 55	17.44	-1.48	17.19	-.39

Note: The number of replicated plots of each variety was as follows: Granger, Utah, 1939, eight; 1945, forty-eight; 1946, thirty-two. Jerome, Idaho, 1945 and 1946, sixteen.

\* Surpasses the 5 percent point of significance.

\*\* Surpasses the 1 percent point of significance.

Included in the tabulation are results obtained by Bion Tolman in 1939 with a reselection from U.S. 33 where a decided increase in tonnage but a decrease in sugar percentage is indicated. The reselections from U.S. 22/3 and U.S. 35 show much smaller and less significant changes and no significant gain in tonnage is indicated for selections from either variety. Some reduction in sugar percentage in the selection from U.S. 35 is indicated, but the changes in U.S. 22/3 are not consistent and most of the differences are not statistically significant.

These small or insignificant changes in yield and sugar content and the marked improvement in curly-top resistance emphasize the desirability of continuing reselection work under severe curly-top exposures. The reselected U.S. 35 showed a somewhat higher degree of curly-top resistance in 1946 than U.S. 22/2 and its sugar percentage in some cases was over one percent higher than U.S. 22/2. This material, therefore, represents a relatively high-sugar type combined with a truly high degree of curly-top resistance, and the information obtained shows clearly that further improvements can be made.