

Varietal Reaction of Sugar Beets to Curly Top Virus Strain 11 Under Field Conditions

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Introduction

It has been established that the virus which causes the curly-top disease of sugar beets is a complex of strains that varies in virulence from those that cause little injury, even on susceptible varieties of sugar beets, to those that are capable of causing appreciable damage to the most resistant varieties. One of the most virulent of these strains was isolated from beets from Jerome, Idaho, and designated by N. J. Giddings (1)² as "strain 11." This strain was used for field inoculation on four hybrid sugar-beet varieties in 1956 and 1957. One of the varieties, carrying the current breeding number 92M1 (CT9 MS X US 22/4), is considered to be highly resistant to curly top and the most resistant of the four in the test. The second variety in the test, F54-4H7 (CT9 MS hybrid X Klein E hybrid), is less resistant to curly top due to the fact that one of its grandparents, Klein E (known also as R. & G. Old Type), a high-yielding German variety, is very low in curly-top resistance. The third variety in the test was SP 561-0. It was developed at Beltsville, Maryland, from cooperative work with the New Mexico Agricultural Experiment Station and was known to be high in curly-top resistance. The fourth variety was 6229, a monogerm obtained by crossing two monogerm lines rated as intermediate type for curly-top resistance.

Methods

The varieties were planted June 6 in the 1956 test, in an area 75 feet long and 16 rows wide. Each 75-foot planting was in turn divided into three 25-foot plots. The plants in each of the eight inside rows of the center 25-foot subplot of each variety were inoculated with curly-top virus strain 11. In 1957, three varieties were planted June 17. In this test each variety was planted in an area 100 feet long and 8 rows wide. The four center rows of each variety were inoculated with curly-top virus strain 11 for the full length of the 100-foot plot. Inoculations were made by caging one beet leafhopper (*Circulifer tenellus* (Baker)) on each plant. The leafhoppers were reared in a greenhouse at the U. S. Agricultural Research Station, Salinas, California, on beets infected with virus strain 11.

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² Number in parentheses refers to literature cited.

The test was conducted in a beet-breeding field at Jerome, Idaho. All the plants of the area were exposed to the natural infection throughout the season.

Results

The natural curly-top exposures in the two years of the test were not equal. The 1956 exposure severely damaged US 33, a variety of intermediate curly-top resistance, whereas in the 1957 test the variety was completely destroyed.

Table 1.—Reaction of Four Sugar-Beet Varieties to Curly Top Virus Strain 11 Following Field Inoculation of Seedling Plants by Means of One Beet Leafhopper Per Plant.

Variety	Year of Test	Acre Yield		Reduction in Yield
		Not Inoculated	Inoculated	
		Tons	Tons	Tons
SL 92M1 (CT9 MS X US 22/4)	1956	15.29	4.75	10.54
F54-4H7 (CT9 MS Hyb. x Klein E. Hyb.)	"	11.55	3.96	7.59
SL 92M1 (CT9 MS X US 22/4)	1957	5.20	3.42	1.78
SP 561-0	"	4.04	2.11	1.93
SL 6229 (aamm X SLC 122 mm)	"	2.47	1.16	1.31

Table 1 shows the results of the reaction of the four varieties when inoculated with virus strain 11 approximately one month after planting. Since the natural curly-top exposure was not as severe in 1956 as in 1957, the effect of strain 11 on yield was more pronounced in 1956. However, it was noteworthy that in spite of the drastic natural curly-top exposure in 1957, the highly virulent virus strain 11 was still able to substantially reduce the yield.

Conclusions

The results of these experiments indicate that curly-top virus strains may occur in Idaho, and perhaps in other areas, that are capable of causing severe damage to varieties of sugar beets that are highly resistant to most of the virus strains prevalent under natural conditions. These findings emphasize the desirability of working with curly-top virus strains of known virulence in breeding for greater resistance to curly-top in sugar beets.

Literature Cited

- (1) GIDDINGS, N. J. 1954. Two recently isolated strains of curly-top virus. *Phytopathology* 44:123-124.