Sugar Beet Varieties in Relation to Curly Top Virus Strains

N. J. Giddings'

The first work with curly top virus strains was prompted by the variable results obtained from inoculations of the sugar beet varieties Old Type and S.L. (68. Some strains of the virus were soon separated (/)[2] and it was found that the variety Old Type was equally susceptible to strains 1 and 3 but thai the variety S. L. *68,* while fairly resistant to strain 1, was practically immune to strain 3. The comparative symptoms induced on S.L. 842, which is equivalent to Old Type in susceptibility, and on S.L. 68 are shown by figures 1 and 2. These two beet varieties showed a similar difference in response to some other virus strains but the difference for strains 1 and 3 was far more striking than any others.

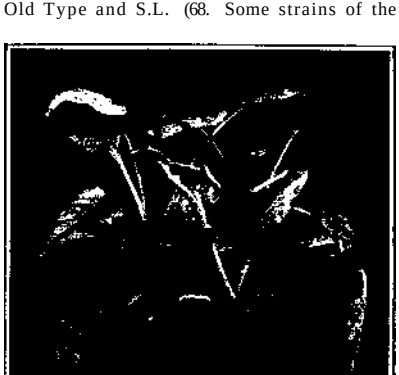

Figure 1.—*beet* S.L. 68 infected with curly top virus strain 1. The plant with curled leaves, in foreground, would bo graded 2 in severity of symptoms and the others 1 or l..5. Photographed 3o days after inoculation.

The reactions of beet varieties to different virus strains have been tested at frequent intervals during the past 12 years. All European varieties which have been tested and the earlier commercial varieties of American origin were quite susceptible to both strains 1 and 3. Only the more recently developed varieties and breeders stocks show a truly high degree of curly top resistance and a' tendency, toward complete immunity against some of the strains.

iSenior Pathologist, Division of Sugar Plant Investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

[2]Italic numbers in parentheses refer to literature cited.

Table 1.—Response of beet varieties to curly top virus strains. Tests of September-November 1940.

Virus strain	Sugar beet variety: S.L. 842 Diseased		U.S. 15 Diseased		U.S. 33 Diseased		U.S. 22 Diseased		A-600 Diseased		S.L. 68 Diseased	
	Pct.	Severity	Pct.	Severity	Pct.	Severity	Pct.	Severity	Pct.	Severity	Pct.	Severity
1	100	3.0	100	2.1	88	2.1	100	1.9	100	2.0		
2	90	2.0	82	1.7	75	1.2	71	1.3	58	1.1	68	1.0
3	100	3.4	65	1.2	0	.0	0	.0	0	.0		
4	80	2.0	82	1.8	75	1.3	63	1.0	67	1.0	10	1.0
5	88	2.2	83	2.2	75	1.3	75	1.0	52	1.0	5	1.0
6	95	2.4	92	2.2	75	1.9	73	1.2	33	1.0	16	1.0
7	85	1.0	75	1.4	50	1.0	13	1.0	0	.0	0	.0
8	85	4.6	75	3.6	92	2.7	13	1.7	33	1.6	0	.0
9	100	4.9	100	4.3	92	3.3	100	1.8	33	1.3	25	1.0
10	92	2.0	82	1.5	92	2.0	0	.0	17	1.0	0	.0

In table 1 arc given the results of one group of tests conducted in 1940. The severity of symptoms is indicated by the figure under the subhead "Severity". Plants showing no symptoms are marked .0, while those with most severe symptoms are graded 5. The S.L. 842 beets shown in figure 1 would be graded 5 while some of the S.L. 68 would be graded 1 and one of them, with curled leaves, would be graded 2. The severity figures given in tables are averages for a group of plants. Among the varieties listed in table 1 it would appear that U. S. 22 and A-600 were about equal in resistance, while U. S. 33 was distinctly better than U. S. 15 and the latter was much superior to S/L. 842. The non-commercial variety S.L. 68 showed the highest resistance of any.

The results of some tests during 1945 are given in table 2. These tests indicate some improvement in TT. S. 22, and the breeders stocks

Table 2.—Response of beet varieties to curly lop virus strains. Tests of August-September 1945.

Virus strain	Sugar beet variety: Diseased S.L.. 842		Disesised U.S. 22		Diseased S.L. 68		Diseased S.L. 5445		Diseased S.n. 5-159	
	Pct.	Severity	Pct.	Severity	Pct.	Severity	Pct.	Severity	Pct.	Severity
1	100	3.0	100	2.1	88	2.1	100	1.O	100	2.0
2	100	2.0	90	1.2	50	1.0	88	1.9	100	1.0
S	100	3.4	65	1.2	0	.0	0	.0	0	.0
4	100	2.0	«5	0.0	71	0.9	63	1.0	100	1.0
o	100	3.7	94	1.0	38	1.0	88	1.0	75	1.O
6	100	3.3	89	1.0	06	0.9	88	1.0	88	1.0
7	100	1.1	65	1.0	0	.0	63	1.0	75	0.7
8	100	3.S	20	1.0	O	.0	25	0.8	0	.0
9	100	4.8	55	1.4	50	1.0	100	1.0	100	1.0
10	75	2.0	5	1.0	0	.0	0	.0	0	.0

Figure 2.—Beet S.L. 842 infected with curly top virus strain 1. These would all be graded 5 in severity of symptoms. S.E.. 842 plants infected with strain 3 show symptoms indistinguishable from this.

S.L. 5445 and 5459 show very nearly, the same degre of resistance as S.L. 68. It has been shown repeatedly that curly top virus strain 3 does not survive in large plants of the variety S. L. 68 even when colonies of 100 or more viruliferous leafhoppers are maintained on them for several weeks. Recent tests indicate that breeders stocks S.L. 5445 and 5459 also are practically immune to virus strain 3 and, if the plants are immune, there is no multiplication of the virus in them. Table 2 shows that there was no infection of the young plants of S.L. 5445 or S.L. 5459 by either strain 3 or strain 10 and beet varieties which are so highly resistant to strain 3 also show high resistance to strains 5, 6, 8, and 9 which cause severe injury or death to infected susceptible beets. Results obtained from other.experiments *(2)* would certainly suggest that the amount of concentration of any curly top virus strain is doubtless much lower in these highly resistant breeders stocks than in more susceptible varieties.

As these recently developed curly top resistant breeders stocks are released and come into widespread use it seems to me that there is good reason to believe that there will be a pronounced decrease in the prevalence of some of the strains of curly top virus which cause so much injury to beets and to other crops.

Literature Cited

1. Giddings, N. J. Studies of Selected Strains of Curly Top Virus. Jour. Agr. Res. 56:883-894. 1938.

2. Giddings, N. J. Some Factors Influencing Curly Top Virus Concentration in Sugar Beets. Phytopathology 36:38-52. 1946.