

SUGAR BEET (*Beta vulgaris* ssp. *vulgaris*)  
Beet curly top; *Beet curly top virus*

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### **Beet curly top resistance in USDA-ARS Plant Introduction lines of sugar beet, 2020.**

The evaluation was conducted at the USDA-ARS North Farm in Kimberly, ID on Portneuf silt loam soil and had been in barley production in 2019. Twenty-six sugar beet (*Beta vulgaris* L.) USDA-ARS Plant Introduction (PI) lines and three commercial check cultivars [Early Wonder (susceptible), HM PM90 (resistant), and SV2012RR (susceptible)] were screened for resistance to *Beet curly top virus* (BCTV). The field was plowed and then fertilized (110 lb N and 120 lb P<sub>2</sub>O<sub>5</sub>/A) and roller harrowed on 27 Mar. The germplasm was planted (density of 51,840 seeds/A) on 18 May. The plots were two rows 10-ft long with 22-in. row spacing and treatments were arranged in a randomized complete block design with six replications. The field was sprinkler irrigated, cultivated, and hand weeded as necessary. Plant populations were thinned to about 23,760 plants/A on 17 Jun. Plants were inoculated at the four- to six-leaf growth stage on 23 Jun with approximately six viruliferous (containing the following BCTV strains: California/Logan and Severe) beet leafhoppers (*Circulifer tenellus* Baker) per plant. The beet leafhoppers were redistributed three times a day during the first two days and then twice a day for five more days by dragging a tarp through the field. The plants were sprayed with Lorsban 4E (1.5 pints/A) on 7 Jul to kill the beet leafhoppers. Plots were rated for foliar symptom development on 13 Jul using a scale of 0 to 9 (0 = healthy and 9 = dead), with the scale treated as a continuous variable (Plant Dis. 90:1539-1544). Data were rank transformed and analyzed in SAS version 9.4 using the general linear model procedure (Proc GLM), and Fisher's protected least significant difference (LSD;  $\alpha = 0.05$ ) was used for mean comparisons. The non-transformed means are presented in the table.

Results for 26 lines and the three checks are reported in the table, as 4 lines (6, 19, 20, and 21) did not grow. Beet curly top symptom development was uniform and no other disease problems were evident in the plot area. The resistant and susceptible checks performed as expected for the visual ratings. Statistically, 13 of the entries contain at least some minor resistance since their visual ratings were significantly lower than those for both susceptible checks. However, only entry 28 was not significantly different from the resistant check. Entry 28 along with entries with similar levels of resistance will be retested and, if resistance is confirmed, these lines will be considered for incorporation into the USDA-ARS germplasm improvement program as a source of resistance to BCTV.

Entry <sup>z</sup>	Source <sup>y</sup>	Description	Curly top rating <sup>xw</sup>
CH6	HM PM90	Resistant check, sugar beet cultivar	5.1 k
28	628755	C869 CMS, 2020A0003	5.9 jk
25	676971	F1043, seed lot F1043	6.2 ij
29	681717	FC1740, seed lot 20141007	6.3 h-j
22	664917	EL62, seed lot EL62	6.3 h-j
16	594910	FC721, seed lot 19931005HO	6.4 h-j
12	634018	FC201, seed lot 20141010	6.4 g-i
2	658060	FC1019, seed lot 20101011	6.5 g-i
11	687276	FC242, seed lot 20191005	6.5 g-i
4	658062	FC1022, seed lot 20091009	6.5 f-i
30	671963	FC305, seed lot 20131006	6.5 e-i
24	608437	F1016, seed lot F1016	6.5 e-i
7	590837	FC607, seed lot 1997A050	6.6 f-i
27	652891	CR933, seed lot 20161019PF	6.6 e-i
3	658061	FC1020, seed lot 20121010	6.6 d-h
23	658654	F1024, seed lot F1024	6.6 d-g
17	590845	FC708, seed lot 20101004	6.7 d-g
15	665053	FC1028, seed lot 20111027	6.8 c-f
9	632251	FC724, seed lot 19961014	6.8 c-e
10	599669	FC727, seed lot 19951017	6.8 cd
CH5	SV2012RR	Susceptible check, sugar beet cultivar	6.9 cd
18	574627	FC716, seed lot 19971019	7.0 cd
1	658059	FC1018, seed lot 20101009	7.0 bc
5	590755	FC702/7, seed lot 19921022	7.4 ab
14	590661	FC701, seed lot 19931018	7.5 ab
RB	Early Wonder	Susceptible check, red beet cultivar	7.6 ab
26	590696	F1002, seed lot F1002	7.6 ab
13	599668	FC709-2, seed lot 20121034	7.7 a
8	590754	FC705/1, seed lot 19851032H	7.8 ab
$P > F^w$			<0.0001

<sup>z</sup> Three entries were commercial check cultivars: CH5 (susceptible), CH6 (resistant), and RB (susceptible).

<sup>y</sup> All lines were *Beta vulgaris* subspecies *vulgaris* (cultivated beet). The Plant Introduction (PI) number has been provided for the non-commercial sources.

<sup>x</sup> Curly top ratings = curly top was rated using a scale of 0 to 9 (0 = healthy and 9 = dead), with disease index (DI) treated as a continuous variable.

<sup>w</sup>  $P > F$  was the probability associated with the F value when using rank transformed data. Within a column, means followed by the same letter did not differ significantly based on Fisher's protected least significant difference (LSD;  $\alpha = 0.05$ ) value. The non-transformed mean values are presented.

NOTE: Since there is no data for the four lines that did not grow, there is no evaluation for them. Only 26 lines were compared against the three checks.