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

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Beet curly top resistance in USDA-ARS Plant Introduction Lines, 2018.

Thirty sugar beet (*Beta vulgaris* L.) Plant Introduction (PI) Lines from the USDA-ARS National Plant Germplasm System (NPGS) and three commercial check cultivars [SV2012RR (susceptible), Detroit Dark Red (susceptible), and HM PM90 (resistant)] were screened for resistance to *Beet curly top virus* (BCTV). The curly top evaluation was conducted at the USDA-ARS North Farm in Kimberly, ID which has Portneuf silt loam soil and had been in barley in 2017. In the spring, the field was plowed and then fertilized (60 lb N and 110 lb P_2O_5/A) and roller harrowed on 5 Apr. Planting at a density of 142,560 seeds/A was done on 29 May. The plots were two rows 10-ft long with 22-in. row spacing and 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 approximately 47,500 plants/A on 22 Jun. Plants were inoculated at the four- to six-leaf growth stage on 25 Jun with approximately six viruliferous (contained the following BCTV strains: California/Logan and Severe) beet leafhoppers 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 9 Jul to kill the beet leafhoppers. Plots were rated for foliar symptom development on 10 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 using the general linear models 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.

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. Based on the visual rating, there were five lines (entries 18, 22, 26, 27, and 29) that were not significantly different from the resistant check. These five lines will be reevaluated and considered for incorporation into future germplasm. These results and germplasm will be accessible to interested parties through the USDA-ARS, NPGS GRIN database (http://www.ars-grin.gov/npgs/index.html).

Entry[z]	Description	Curly top rating[y]
HM PM90	Resistant check, sugar beet	4.2 p
26	PI 467869; China, Fan yu 1, sugar beet	4.3 op
29	PI 538250; United States, California, C28, sugar beet	4.4 op
18	PI 220165; Afghanistan, IDBBNR 5384, fodder beet	5.0 m-p
27	PI 476323; Soviet Union (former), Ramonskaja odnosemennaja 32, sugar beet	5.0 n-p
22	PI 266100; Poland, BI IHAR, sugar beet	5.2 l-p
10	PI 173642; Turkey, IDBBNR 5304, fodder beet	5.7 k-o
6	PI 142818; Iran, Choghondar, fodder beet	5.7 k-n
17	PI 206407; Turkey, IDBBNR 5377, fodder beet	5.8 j-m
2	PI 120691; Turkey, IDBBNR 5178, fodder beet	5.9 j-m
SV2012RR	Susceptible check, sugar beet	6.0 i-l
25	PI 386205; Soviet Union (former), VNIS F-510, sugar beet	6.2 h-j
30	PI 540576; France, WB 830, wild beet	6.2 g-j
16	PI 204678; Turkey, IDBBNR 5375, fodder beet	6.2 i-k
14	PI 176432; Turkey, Kocabas, fodder beet	6.3 g-j
28	PI 510669; United States, North Dakota, F1008, sugar beet	6.3 g-j
21	PI 232887; Hungary, Babolnai Sarga Henger, fodder beet	6.3 g-j
4	PI 140357; Iran, IDBBNR 5207, fodder beet	6.4 f-j
23	PI 357361; Macedonia, Gostivarska Zelena, fodder beet	6.4 f-j
24	PI 381647; Soviet Union (former), Ramonsk 100, sugar beet	6.6 e-i
19	PI 220645; Afghanistan, IDBBNR 5388, sugar beet	6.7 d-i
11	PI 175600; Turkey, Karaca Oren, fodder beet	6.7 e-i
Detroit Dark Red	Susceptible check, red beet	6.7 d-i
8	PI 169027; Turkey, IDBBNR 5271, fodder beet	6.9 c-h
1	NSL 31344; United States, Oregon, Giant Yellow Eckendorf, fodder beet	6.9 b-g
12	PI 176426; Turkey, Kocabas, fodder beet	6.9 b-f
3	PI 120707; Turkey, IDBBNR 5194, fodder beet	7.0 b-e
7	PI 142820; Iran, Choghondar, sugar beet	7.2 a-d
13	PI 176429; Turkey, Kocabas, fodder beet	7.3 b-e
20	PI 222768; Iran, Choghondar, fodder beet	7.4 a-c
9	PI 171513; Turkey, IDBBNR 5284, fodder beet	7.7 ab
5	PI 142811; Iran, Choghondar, fodder beet	8.7 a
$P > F$[x]		<0.0001

[z] Three entries were commercial check cultivars (bold): SV2012RR (susceptible), Detroit Dark Red (susceptible), and HM PM90 (resistant). Only 29 of the 30 Plant Introduction Line entries are presented in the table since seed for entry 15 was not viable.

[y] 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.

[x] $P > F$ 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 in the table.