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

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Beet curly top resistance in USDA-ARS Plant Introduction Lines, 2013.

Thirty sugar beet (*Beta vulgaris* L.) Plant Introduction (PI) Lines from the USDA-ARS National Plant Germplasm System and three checks [Monohikari (susceptible), HM PM90 (resistant), and Beta G6040 (resistant)] were screened for resistance to *Beet severe curly top virus* (BSCTV) and closely related *Curtovirus* species in 2013. 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 alfalfa in 2012. The field was plowed in the fall and in the spring, it was fertilized (90 lb N and 110 lb P_2O_5/A) on 19 Apr 13, sprayed with Ethotron (2 pt/A) for weed control, and roller harrowed. The germplasm was planted (density of 142,560 seeds/A) on 20 May. The plots were two rows 10 ft long with 22-in row spacing and arranged in a randomized complete block design with three replications. The fields were sprinkler irrigated and hand weeded as necessary. Plant populations were thinned to about 23,760 plants/A on 14 Jun. Plants were inoculated at the four- to six-leaf growth stage on 27 Jun with approximately six viruliferous beet leafhoppers per plant. The beet leafhoppers were redistributed twice a day (immediately after sunrise and just before sunset) for one week by dragging a tarp through the field to disrupt settled/feeding leafhoppers. The plants were sprayed with Lorsban 4E (1.5 pints/A) on 2 Jul to kill the beet leafhoppers. The plots were rated for foliar symptom development on 16 Jul using a scale of 0-9 (0 = healthy and 9 = dead), with the scale treated as a continuous variable (Plant Dis. 90:1539-1544). Data were analyzed in SAS using the general linear models procedure (Proc GLM), and Fisher's protected least significant difference ($\alpha = 0.05$) was used for mean comparisons.

Curly top symptom development was uniform and no other disease problems were evident in the plot area. The disease pressure in the test was moderately severe with good symptom development in the susceptible check. Twelve of the PIs were not significantly different from the resistant control, HM PM90. Of these 12 PIs, three performed extremely well, one from Greece (PI546423) and two from Portugal (PI604524, PI604539). They will be retested and, if resistance is confirmed, they will be incorporated into the USDA-ARS germplasm improvement program as potentially novel sources of resistance to BSCTV and closely related *Curtovirus* species. These results will be accessible to interested parties through the USDA-ARS, NPGS GRIN database (http://www.ars-grin.gov/npgs/index.html).

Entry[w]	Designation	Subspecies[x]	Curly top rating[y]
9	PI604516, Greece, Seskla	*maritima*	7.0 ab
19	PI604526, Portugal, Madeira Islands, IDBBNR 6069	*maritima*	7.0 a
V4	**Monohikari** (susceptible check)	*vulgaris*	6.8 ab
11	PI604518, Greece, IDBBNR 3356	*maritima*	6.6 a-d
12	PI604519, Italy, Sicily, IDBBNR 3390	*maritima*	6.6 a-d
2	PI504189, Italy, Wild beet	*maritima*	6.6 a-c
13	PI604520, Spain, Alicante, IDBBNR 3628	*maritima*	6.4 a-e
21	PI604528, Spain, Baleares, IDBBNR 6085	*maritima*	6.1 a-f
8	PI599349, USA, CA, N499	*maritima*	6.0 a-f
1	PI274394, Poland, Warszawa, Poly-mono IharPI504189, Italy, Wild beet	*vulgaris*	5.9 a-g
16	PI604523, Greece, IDBBNR 3742	*maritima*	5.9 a-g
22	PI604529, Spain, Baleares, IDBBNR 6096	*maritima*	5.9 a-g
26	PI599352, USA, CA, R720	*maritima*	5.9 a-g
28	PI604542, France, Morbihan, IDBBNR 7103	*maritima*	5.9 a-g
29	PI604544, France, Morbihan, IDBBNR 7105	*maritima*	5.8 a-h
14	PI604521, Germany, IDBBNR 3705	*maritima*	5.8 a-g
20	PI604527, Spain, Balearic Islands, IDBBNR 6072	*maritima*	5.7 a-i
24	PI604535, Former Serbia and Montenegro, IDBBNR 6952	*maritima*	5.7 a-i
10	PI604517, Greece, IDBBNR 3350	*maritima*	5.6 a-i
15	PI604522, Greece, IDBBNR 3739	*maritima*	5.3 b-j
3	PI504274, France, Wild beet	*maritima*	5.1 c-j
18	PI604525, Spain, IDBBNR 5935	*maritima*	5.0 c-j
27	PI604541, Portugal, Aveiro, IDBBNR 7101	*maritima*	4.9 d-j
6	PI540639, France, WB 893	*maritima*	4.9 c-j
30	PI604547, Germany, IDBBNR 9172	*maritima*	4.8 e-j
23	PI604534, Netherlands, IDBBNR 6522	*maritima*	4.7 f-j
4	PI518298, UK, England, IDBBNR 5792	*maritima*	4.6 f-j
5	PI518353, UK, England, IDBBNR 5847	*maritima*	4.6 f-j
17	PI604524, Portugal, Lisboa, IDBBNR 3851	*maritima*	4.3 g-j
25	PI604539, Portugal, IDBBNR 7079	*maritima*	4.1 h-j
31	**Beta G6040** (resistant check)	*vulgaris*	4.0 ij
7	PI546423, Greece, IDBBNR 5616	*maritima*	3.9 j
V2	**HM PM90** (resistant check)	*vulgaris*	3.9 j
Overall mean			5.5
$P > F^z$			0.0017
LSD ($\alpha = 0.05$)			1.7

[w] Three entries were checks (bold): Monohikari (susceptible), Beta G6040 (resistant), and HM PM90 (resistant).

[x] All lines were *Beta vulgaris*. Subspecies *vulgaris* are cultivated beet and subspecies *maritima* are sea beet, the wild progenitor.

[y] Curly top was rated using a scale of 0-9 (0 = healthy and 9 = dead), with the scale treated as a continuous variable (Plant Dis. 90:1539-1544).

[z] *P* > F was the probability associated with the F value. LSD = Fisher's protected least significant difference value ($\alpha = 0.05$). Within a column, means followed by the same letter did not differ significantly based on Fisher's protected LSD.