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

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Beet curly top resistance in USDA-ARS Kimberly germplasm, 2022.

Eight sugar beet (*Beta vulgaris* L.) germplasm lines produced by the USDA-ARS Kimberly sugar beet program and three commercial check cultivars [Detroit Dark Red (susceptible), HM PM90 (resistant), and SV2012RR (susceptible)] 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 2021. The field was plowed and then fertilized (110 lb N and 160 lb P_2O_5/A) and roller harrowed on 6 Apr. The germplasm was planted at the density of 114,048 seeds/A on 3 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. Plants were inoculated at the four- to six-leaf growth stage on 15 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 two times a day during the first seven days by dragging a tarp through the field. The plants were sprayed with Admire Pro (3.5 fl oz/A) on 27 Jun to kill the beet leafhoppers. Plots were rated for foliar symptom development on 6 Jul using a scale of 0 to 9 (0 = healthy and 9 = dead; Plant Dis. 90:1539-1544). Data were rank transformed prior to analysis in SAS (Ver. 9.4) with mixed linear models (Proc MIXED), but the non-transformed means have been presented in the table. Mean separation was based on a PDIFF comparison with a probability cutoff of 0.05.

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, five of the entries contain at least some minor resistance since their visual ratings were significantly lower than those for both susceptible checks. However, only three entries (1, 3, and 4) were not significantly different from the resistant check. These three entries 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[z]	Source[y]	Description	Curly top rating[x]
CH6	HM PM90	Resistant check, sugar beet cultivar	4.1 f
4	KDH4-9	PI 683513; BCTV resistant double haploid genetic stock	4.2 ef
1	KDH13	PI 663862; BCTV resistant double haploid genetic stock	4.2 ef
3	KDH39-33/KDH13	Breeding population selected F_4 families	4.3 ef
7	KEMS12/KPS24 CTN-3	Selected breeding line from F_4 population for high sucrose + BCTV resistance	4.6 de
5	KEMS12/KPS24 CTN-1	Selected breeding line from F_4 population for high sucrose + BCTV resistance	4.8 d
CH5	SV2012RR	Susceptible check, sugar beet cultivar	6.2 c
8	KEM12/KPS25	F_4 breeding population targeting high sucrose	6.3 c
6	KEMS12/KPS24 CTN-2	Selected breeding line from F_4 population for high sucrose + BCTV resistance	6.4 bc
RB	Detroit Dark Red	Susceptible check, red beet cultivar	6.6 ab
2	KDH19-17	BCTV susceptible double haploid breeding line	7.6 a
P > *F*[w]			<0.0001

[z] Three entries were commercial check cultivars: CH5 (susceptible), CH6 (resistant), and RB (susceptible). BCTV = Beet curly top virus.
[y] All lines were *Beta vulgaris* subspecies *vulgaris* (cultivated beet).
[x] Curly top ratings = beet curly top was rated using a scale of 0 to 9 (0 = healthy and 9 = dead).
[w] *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 PDIFF with a probability cutoff of 0.05. The non-transformed mean values are presented.