

Beet curly top resistance in USDA-ARS Kimberly germplasm, 2020.

Eight sugar beet (*Beta vulgaris* L.) germplasm lines produced by the USDA-ARS Kimberly sugar beet program 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 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 2019. The field was plowed and then fertilized (110 lb N and 120 lb P₂O₅/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 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.

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, four of the entries contain at least some minor resistance since their visual ratings were significantly lower than those for both susceptible checks. However, only one new line (KDH39/KDH13) and one genetic stock line (KDH13) were not significantly different from the resistant checks. The KDH39/KDH13 line will be retested and, if resistance is confirmed, this line will be considered for incorporation into the USDA-ARS germplasm improvement program as a source of resistance to BCTV.

Entry ^z	Description	Curly top rating ^y
KDH13	PI 663862; curly top resistant genetic stock	5.1 g
HM PM90	Resistant check; commercial sugar beet cultivar	5.1 fg
KDH39/KDH13	Population from selected F ₄ families	5.8 ef
KEMS12/KPS24	F ₃ population	6.3 de
KEMS12-FP17	Selected from PI 672570; potential line for frost tolerance and hard to bolt	6.5 d
SV2012RR	Susceptible check; commercial sugar beet cultivar	6.9 c
KEMS12/KPS19	F ₃ population	7.2 c
Early Wonder	Susceptible check; commercial red beet cultivar	7.6 b
KEMS12/KPS25	F ₃ population targeting high sucrose	7.6 b
KDH19-17	Susceptible genetic stock; homozygous susceptible	8.1 ab
ELRIL-125	Recombinant inbred line: East Lansing, MI biparental table beet and sugar beet	8.3 a
$P > F^x$		<0.0001

^z Three entries were commercial check cultivars: Early Wonder (susceptible), HM PM90 (resistant), and SV2012RR (susceptible).

^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.