

**Beet curly top resistance in USDA-ARS Kimberly germplasm lines evaluated in Idaho, 2017.**

Thirteen sugar beet (*Beta vulgaris* L.) germplasm lines from the USDA-ARS Kimberly Sugar Beet program and two commercial check cultivars [SV2012RR (susceptible) and HMPM90 (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 2016. In the spring, the field was plowed and fertilized (90 lb N and 110 lb P<sub>2</sub>O<sub>5</sub>/A) and roller harrowed on 11 Apr. The germplasm was planted (density of 142,560 seeds/A) on 15 May. The plots were two rows 10 ft long with 22-in. row spacing and arranged in a randomized complete block design with six replicates. The field was sprinkler irrigated, cultivated, and hand weeded as necessary. Plant populations were thinned manually to about 47,500 plants/A on 9 Jun. Plants were inoculated at the four- to six-leaf growth stage on 14 Jun with approximately six viruliferous beet leafhoppers (contained at least the following BCTV strains: California/Logan and Severe) 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 28 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), with the scale treated as a continuous variable (Plant Dis. 90:1539-1544). During the disease rating, leaf samples were collected and evaluated by enzyme-linked immunosorbent assay (ELISA) as described previously (Plant Dis. 94:972-976). Data were 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.

Curly top symptom development was uniform and no other disease problems were evident in the plot area. The checks performed as expected for both the visual rating and ELISA. Based on both visual ratings and ELISA, KDH4-9 (PI683513) and KDH13 (PI663862) performed the same as the resistant check. All the KDH13 progenies (crossed to susceptible parental lines) had moderate visual ratings, while two of the progenies (KDH13/EMS9 and KDH13/19-19) had ELISA values that were not different from the resistant check. KDHEMS9 is new line that had very low virus accumulation. These results and germplasm information will be accessible through the USDA-ARS, NPGS GRIN database (<http://www.ars-grin.gov/npgs/index.html>).

Entry <sup>z</sup>	Description <sup>y</sup>	ELISA <sup>x</sup>	Curly top rating <sup>w</sup>
KDH4-9	Doubled haploid; PI683513, full-sib of PI663862	1.44 ef	3.3 h
KDH13	Doubled haploid; PI663862	1.39 ef	3.4 h
<b>HMPM90</b>	<b>Commercial resistant check</b>	<b>1.24 f</b>	<b>3.8 h</b>
KDH13/EMS9	Population PI663862/PI672569	1.49 d-f	4.7 g
KDH13/K39	Population of PI663862/PI608798	1.84 a-c	4.8 fg
KDH13/19-19	Population KDH13- PI663862/K19-19	1.51 d-f	4.9 fg
KDHEMS9	Doubled haploid from PI672569	1.32 f	5.3 e-g
KDH709-2 (pool)	Doubled haploid from PI599668 (FC709-2)	1.90 a-c	5.5 d-f
KEMS8	PI683516	1.99 ab	5.8 de
KPS25	Breeding line, high sugar	1.77 a-d	5.9 de
KEMS43	C5944-EMS treated. Pool mutant populations	2.01 a	6.1 d
KDH39-33	Doubled haploid from PI608798	1.67 c-e	6.2 cd
<b>SV2012</b>	<b>Commercial susceptible check</b>	<b>1.88 a-c</b>	<b>6.9 bc</b>
KEMS8-450	Gamma-ray at 450Gy mutant from PI683516	1.96 a-c	7.2 b
K19-17	Kimberly breeding line susceptible check	1.78 a-d	8.2 a
$P > F^v$		<0.0001	<0.0001
LSD		0.31	0.8

<sup>z</sup> Two entries were commercial check cultivars (bold): SV2012RR (susceptible) and HMPM90 (resistant).

<sup>y</sup> All lines were *Beta vulgaris*. PI = plant introduction line.

<sup>x</sup> ELISA = the enzyme-linked immunosorbent assay (ELISA) values recorded at OD 405 nm. The negative background checks for the ELISA assay averaged 0.09 ± 0.01.

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

<sup>v</sup>  $P > F$  was the probability associated with the F value. 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.