

SUGAR BEET (*Beta vulgaris*)  
Rhizomania; *Beet necrotic yellow vein virus*  
Storage rot; *Athelia* sp., *Botrytis* sp., and  
*Penicillium* sp.

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### **Commercial sugar beet cultivars evaluated for rhizomania resistance and storability in Idaho, 2011.**

Thirty-one commercial sugar beet cultivars were evaluated in a sprinkler-irrigated sugar beet field near Kimberly, ID where barley was grown in 2010. The trial was conducted in a field that contained Portneuf silt loam soil and relied on natural infection for rhizomania development. The plots were planted on 4 May 11 to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 14 Jun. Plots were four rows (22-in. row spacing) and 24 ft long. The experimental design was a randomized complete block design with four replications per cultivar. The crop was managed according to standard cultural practices. The plot was rated for the percentage of plants with foliar rhizomania symptoms on 22 Aug. The plants were mechanically topped and the center two rows were dug with a mechanical harvester on 17-18 Oct. At harvest, the roots were evaluated for rhizomania using a scale of 0-9 (0 = healthy and 9 = dead) in a continuous manner. The percent sucrose at harvest was established based on two eight-root samples from each plot. The samples were submitted to the Amalgamated Tare Lab (determined percent sucrose, conductivity, nitrates, and tare). At harvest, eight roots per plot were also placed in a mesh onion bag, weighed, and placed in an indoor commercial sugar beet storage facility in Paul, ID on 19 Oct set to hold 35°F. On 15 Feb 12, roots were retrieved after 120 days in storage and evaluated for surface root rot (% of root area), weight, and percent sucrose (via gas chromatography). Only samples from the same plots were compared, when establishing percent reduction in sucrose at harvest versus storage. Data were analyzed using the general linear models procedure (Proc GLM-SAS), and Fisher's protected least significant difference was used for mean comparisons.

Root rots and other disease problems other than rhizomania were not evident in the plot area. There were significant differences among cultivars for all variables. Rhizomania was uniform based on foliar symptoms (100% susceptible) in the susceptible check, C-209. C-11 (root rating 3.1; foliar rating 48% susceptible) and B-38 (3.0 and 31%) were marginal for rhizomania resistance, since cultivars with root ratings  $\geq 3.0$  are considered susceptible. Surface root rot ranged from 1.0 to 14.2%, depending on cultivar. This surface root rot range may not seem significant, but a previous study has shown that 20% rot on the root surface can lead to 100% increase in respiration (J. Amer. Soc. Sugar Beet Technol. 19:157-162). Root yield averaged 34.1 tons/A, which was similar to Idaho's average of 34.4 tons/A (USDA-National Ag. Stat. Service). By the end of the storage season, weight loss ranged from 5.1 to 11.2%, sucrose losses ranged from 25.2 to 66.9%, and ERS ranged from 2,034 to 8,429 lb/A. Given the range of responses, selecting cultivars for rhizomania resistance and storability will lead to considerable economic benefit for the sugar beet industry.

Cultivar <sup>u</sup>	Rhizomania rating <sup>t</sup>		Surface root rot (%) <sup>v</sup>	Weight reduction (%) <sup>w</sup>	Root yield (tons/A)	ERS at harvest (lb/A) <sup>x</sup>	Sucrose reduction (%) <sup>y</sup>	ERS after storage (lb/A)
	Foliar (%)	Root						
SV007	1 d	2.5 e-g	4.0 e-h	7.2 c-g	40.6 a	11,576 a	27.1 i-k	8,429 a
C-29	0 d	2.2 i-l	3.2 f-h	7.9 b-e	36.3 a-h	10,511 a-f	25.7 jk	7,817 ab
<b>HM080012</b>	0 d	2.2 g-j	2.5 f-h	7.7 b-e	39.0 ab	10,268 a-f	26.8 jk	7,514 a-c
HM080006	0 d	2.7 cd	3.2 f-h	6.8 d-h	37.0 a-f	10,582 a-e	31.3 g-k	7,309 a-d
SV006	1 d	2.4 e-h	2.8 f-h	6.3 d-h	35.7 a-i	9,594 c-h	25.2 k	7,175 a-d
SV011	1 d	2.4 e-h	13.5 ab	6.6 d-h	37.5 a-d	10,445 a-f	31.1 g-k	7,174 a-d
C-25	2 d	2.4 e-h	3.2 f-h	7.5 b-e	36.5 a-g	10,819 a-d	33.8 f-k	7,135 b-d
HM070006	0 d	2.3 g-j	5.0 d-h	8.8 bc	34.9 b-j	10,474 a-f	33.3 f-k	6,994 b-e
B-7	1 d	2.4 e-h	4.2 d-h	6.7 d-h	33.7 b-j	9,802 b-h	28.8 h-k	6,945 b-f
B-37	2 d	2.4 e-h	5.0 d-h	7.5 b-e	37.4 a-d	10,846 a-c	37.0 d-h	6,848 b-g
C-204	0 d	2.2 j-l	7.0 b-h	6.1 e-h	37.1 a-e	10,708 a-e	35.9 e-h	6,848 b-g
B-5	1 d	2.5 d-f	1.8 gh	7.1 c-g	34.9 b-j	10,298 a-f	33.3 f-k	6,844 b-g
B-39	0 d	2.4 e-h	4.8 d-h	8.0 b-d	35.9 a-i	9,908 a-h	33.4 g-k	6,801 b-h
SX015	1 d	2.0 kl	14.2 a	7.4 b-e	33.0 c-j	9,504 d-h	32.6 f-k	6,409 c-i
<b>HM070022</b>	3 d	2.0 l	4.2 d-h	5.1 h	33.6 b-j	9,810 b-h	35.7 e-i	6,320 c-i
HM103425	0 d	2.8 c	1.0 h	7.3 b-f	35.0 a-j	10,060 a-g	37.3 d-h	6,304 c-i
SV010	0 d	2.4 e-h	8.5 a-f	5.5 f-h	31.6 e-j	9,326 d-h	32.0 f-k	6,294 c-j
HM118711	1 d	2.6 c-e	4.8 d-h	9.1 b	38.2 a-c	11,353 ab	44.8 b-d	6,262 c-j
C-30	0 d	2.0 j-l	4.2 d-h	6.9 d-h	35.0 a-j	10,148 a-f	39.1 c-g	6,169 d-j
C-208	0 d	2.2 h-k	3.5 f-h	6.8 d-h	34.6 b-j	9,836 b-h	40.3 c-f	5,818 e-j
B-43	4 d	2.2 j-l	10.2 a-e	7.2 c-g	35.5 a-i	10,902 a-c	47.6 bc	5,720 e-j
<b>HH016</b>	1 d	2.5 e-g	8.2 a-g	7.4 b-e	29.4 j	8,412 gh	32.6 f-k	5,658 f-j
B-42	2 d	2.2 g-j	7.2 b-h	7.3 b-f	31.4 f-j	8,432 gh	33.3 f-k	5,619 g-j
B-110	0 d	2.6 c-f	6.0 c-h	5.4 gh	30.5 ij	9,128 e-h	38.6 d-g	5,593 g-j
SV003	1 d	2.4 e-h	10.8 a-d	6.2 d-h	32.4 d-j	9,158 d-h	39.8 c-g	5,549 h-j
HH017	2 d	2.4 e-h	3.2 f-h	7.7 b-e	29.8 j	8,287 h	33.9 f-j	5,486 ij
C-11	48 b	3.1 b	12.2 a-c	7.4 b-e	37.6 a-d	10,576 a-e	49.0 b	5,390 ij
HM113545	1 d	2.5 e-g	8.0 a-g	7.4 b-e	29.4 j	8,845 f-h	38.9 d-g	5,348 ij
B-34	1 d	2.4 f-i	8.8 a-f	7.3 b-f	30.7 h-j	9,225 d-h	43.2 b-e	5,250 ij
B-38	31 c	3.0 b	5.5 d-h	8.0 b-d	31.1 g-j	9,025 e-h	44.8 b-d	5,003 j
<b>C-209</b>	100 a	4.1 a	10.8 a-d	11.2 a	20.4 k	6,006 i	66.9 a	2,034 k
Overall mean	6.6	2.5	6.2	7.2	34.1	9,802	36.5	6,260
<i>P</i> > <i>F</i> <sup>z</sup>	<0.0001	<0.0001	0.0018	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD	4	0.2	6.6	1.9	5.7	1,687	8.7	1,293

<sup>t</sup> Foliar = percentage of foliage in plot with rhizomania symptoms on 22 Aug. Root = roots were evaluated for rhizomania using a scale of 0 to 9 (0 = healthy, 9 = dead; Plant Dis. 92:581-587) in a continuous manner at harvest.

<sup>u</sup> For more information on coded cultivars, contact the following companies: B = Betaseed Inc., C = ACH Seeds Inc., HH = Holly Hybrids, HM = Hilleshog, SV = SESVanderHave, and SX = Seedex. Check cultivars (bold) were C-209 (rhizomania susceptible check), HH016 (storage susceptible check), HM080012 (storage resistant check), and HM070022 (storage resistant check).

<sup>v</sup> Surface root rot = percentage of root surface area discolored.

<sup>w</sup> Weight reduction = difference in weight from harvest to end of storage.

- <sup>x</sup> ERS = estimated recoverable sucrose was calculated as extraction x 0.01 x gross sucrose and extraction = 250 + [1255.2 x (conductivity - 15000) x (percent sucrose - 6185)]/(percent sucrose x [98.66 - (7.845 x conductivity)]).
- <sup>y</sup> Sucrose reduction (%) = (1-(((% Sucrose<sub>storage sample</sub> - 1.395) x Weight<sub>storage sample</sub>)/(% Sucrose<sub>harvest sample</sub> x Weight<sub>harvest sample</sub>))) x 100.
- <sup>z</sup>  $P > F$  was the probability associated with the F value. Within each variable, means followed by the same letter did not differ significantly based on Fisher's protected least significant difference (LSD;  $\alpha = 0.05$ ).