

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, 2010.

Twenty-eight commercial sugar beet cultivars were evaluated in a sprinkler-irrigated sugar beet field near Kimberly, ID where sugar beet were grown in 2009. The field 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 26 Apr 10 to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 12 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 plants were mechanically topped and the center two rows were collected with a mechanical harvester on 18 Oct. At harvest the roots were evaluated for rhizomania (Rz rating) using a scale of 0-9 (0 = healthy and 9 = dead). 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 7 Feb 11 roots were retrieved after 112 days in storage and evaluated for weight, percentage of surface area covered by rot or microbial growth, 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 in SAS (Ver. 9.2) using the generalized linear mixed models procedure (Proc GLIMMIX), and least squares means ($\alpha = 0.05$) were used for mean comparisons.

Root rots and other disease problems other than rhizomania were not evident in the plot area. Rhizomania was uniform based on foliar and root symptoms. There were significant differences among cultivars for all variables. C-209 (rhizomania susceptible check) was susceptible to rhizomania as expected based on both foliar and root symptoms. However, three commercial cultivars (B-37, B-38, and C-11) also had more foliar symptoms than expected. Root yield averaged 34.8 tons/A which was higher than Idaho's average of 31.0 tons/A (USDA-National Ag. Stat. Service). Surface root rot ranged from 1 to 14%, depending on cultivar. By the end of the storage season, weight loss ranged from 4.9 to 8.9% and sucrose losses ranged from 20 to 41%. Thus, improving storability in sugar beet cultivars to reduce sucrose losses could have considerable economic benefit.

Cultivar ^z	Rhizomania rating ^y		Surface root rot (%) ^x	Weight reduction (%) ^w	Root yield (tons/A)	ERS at harvest (lb/A) ^v	Sucrose red. (%) ^u	ERS after storage (lb/A)
	Foliar	Root						
C-29	0 f	2.4 i-l	3 f-h	6.8 b-h	38.2 ab	11,551 a	20 j	9,204 a
C-27	2 ef	2.4 i-l	2 f-h	4.9 i	38.2 ab	11,353 ab	21 ij	8,942 ab
HM070022	2 ef	2.6 d-j	4 c-h	6.8 b-h	36.4 a-c	11,162 a-c	22 h-j	8,696 a-c
B-39	0 f	2.7 b-f	4 c-h	6.9 b-h	35.5 a-d	10,902 a-c	21 ij	8,602 a-d
C-19	1 ef	2.5 e-j	2 f-h	6.3 c-i	33.6 a-e	10,502 a-d	20 j	8,429 a-e
HM080011	0 f	2.7 b-g	5 b-h	7.6 a-f	34.5 a-e	10,670 a-d	24 g-j	8,105 a-f
HM070006	0 f	2.6 d-j	2 f-h	8.0 a-c	36.2 a-d	10,709 a-d	24 g-j	8,042 a-g
C-28	9 d	2.7 b-h	10 a-c	5.4 g-i	36.0 a-d	11,243 ab	29 c-h	7,976 b-g
SV007	0 f	2.3 kl	9 a-e	7.7 a-e	38.3 a	11,515 a	31 b-f	7,905 b-g
HH017	1 ef	2.5 f-j	6 b-h	6.5 c-i	36.3 a-d	10,511 a-d	25 e-j	7,873 b-g
HH016	2 ef	2.5 g-j	10 ab	6.2 d-i	36.5 a-c	10,819 a-c	27 d-i	7,847 b-g
HM080006	3 d-f	2.8 b-e	4 c-h	7.5 a-f	37.8 ab	10,554 a-d	26 e-j	7,796 b-h
B-5	2 ef	2.5 f-j	4 d-h	7.7 a-e	37.4 ab	10,846 a-c	31 c-g	7,500 c-h
HM080012	2 ef	2.8 b-d	1 h	8.5 ab	33.1 a-e	9,544 c-g	21 ij	7,471 d-h
SV003	5 ef	2.8 b-e	6 b-g	7.0 b-g	37.1 a-c	10,708 a-d	32 b-e	7,318 e-i
B-7	4 d-f	2.6 d-i	3 e-h	5.2 g-i	30.5 d-f	9,128 d-g	20 j	7,253 e-i
B-37	32 c	2.9 b	5 b-h	5.3 g-i	32.4 b-e	9,751 b-f	26 e-j	7,192 f-i
SV001	6 d-f	2.5 g-k	6 b-h	6.0 e-i	34.6 a-e	9,836 b-f	27 d-j	7,181 f-i
C-208	1 f	2.4 i-l	4 d-h	5.1 hi	33.9 a-e	9,583 c-g	25 f-j	7,162 f-i
HM080004	2 ef	2.5 g-k	3 f-h	6.8 b-h	37.0 a-c	10,189 a-e	30 c-g	7,108 f-i
C-25	2 ef	2.6 d-i	3 e-h	6.8 b-h	29.4 ef	8,845 e-g	21 ij	6,997 f-i
B-34	1 f	2.2 l	9 a-d	5.8 f-i	35.7 a-d	9,946 a-f	30 c-g	6,929 f-j
C-204	7 de	2.4 h-l	9 a-e	6.5 c-i	36.8 a-c	10,315 a-e	33 b-d	6,877 g-j
HH015	4 d-f	2.6 c-i	14 a	6.6 c-i	37.6 ab	10,576 a-d	38 ab	6,606 h-j
C-11	46 b	2.6 b-h	6 b-h	6.2 d-i	29.0 ef	8,005 gh	22 h-j	6,227 ij
B-38	42 b	2.8 bc	7 b-f	6.8 b-h	31.4 c-e	8,432 f-h	28 c-i	6,139 ij
C-12	4 d-f	2.3 j-l	9 a-d	7.9 a-d	36.1 a-d	9,810 b-f	41 a	5,736 jk
C-209	96 a	3.5 a	1 gh	8.9 a	25.4 f	7,105 h	35 a-c	4,621 k
Overall mean	9.9	2.6	5	6.7	34.8	10,147	27	7,419
$P > F^t$	<0.0001	<0.0001	0.0007	0.0009	0.0013	<0.0001	<0.0001	<0.0001

^z For more information on coded cultivars contact the respective companies: B = Betaseed Inc., C = ACH Seeds Inc., HH = Holly Hybrids, HM = Hillehog, and SV = SESVanderHave. HM080012 (resistant storage check) and C-209 (susceptible rhizomania check) were included as check cultivars (bold).

^y Foliar = percentage of plants with foliar rhizomania symptoms, Root = roots were evaluated for rhizomania using a scale of 0-9 (0 = healthy, 9 = dead; Plant Dis. 92:581-587) at harvest.

^x Surface root rot = percentage of root surface area discolored by rot and microbial growth.

^w Weight reduction = difference in weight from harvest to end of storage.

^v ERS = estimated recoverable sucrose was calculated as extraction x 0.01 x gross sucrose and extraction = $250 + [1255.2 \times (\text{conductivity} - 15000) \times (\text{percent sucrose} - 6185)] / (\text{percent sucrose} \times [98.66 - (7.845 \times \text{conductivity})])$.

^u Sucrose reduction (%) = $(1 - ((\% \text{ Sucrose}_{\text{storage sample}} - 1.395) \times \text{Weight}_{\text{storage sample}}) / (\% \text{ Sucrose}_{\text{harvest sample}} \times \text{Weight}_{\text{harvest sample}})) \times 100$.

^t $P > F$ was the probability associated with the F value. Within each variable, means followed by the same letter did not differ significantly based on least squares means ($\alpha = 0.05$).