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

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Experimental sugar beet cultivars evaluated for rhizomania resistance and storability in Idaho, 2009.

Thirty-four experimental sugar beet cultivars and five commercial check cultivars were evaluated in a commercial sprinkler-irrigated sugar beet field near Declo, ID where winter wheat was grown in 2008. The field trial relied on natural infection for rhizomania development. The plots were planted on 20 Apr 09 to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 8 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 13 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 14 Oct set to hold 35°F. On 18 Feb 10, the roots were evaluated for the percentage of surface area covered by fungal growth. On 22 Feb 10 roots were retrieved after 131 days in storage and evaluated for 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. Rhizomania was uniform based on foliar symptoms, but root symptom development was minimal. Nevertheless, there were significant differences among cultivars for all variables, except fungal growth on the root surface in storage. B-101 was borderline for rhizomania resistance, since cultivars with ratings over 3.0 are considered susceptible. Root yield averaged 37 tons/A which was higher than Idaho's average of 31 tons/A (USDA-National Ag. Stat. Service). Surface fungal growth ranged from 4 to 30% and surface root rot ranged from 1 to 20%, depending on cultivar. By the end of the storage season, weight loss ranged from 3.1 to 7.1% and sucrose losses ranged from 23 to 57%. Thus, improving storability in sugar beet cultivars to reduce sucrose losses could have considerable economic benefit.

Cultivar[z]	Rz rating[y]	Surface fungal growth (%)[x]	Surface root rot (%)[w]	Weight reduction (%)[v]	Root yield (tons/A)	ERS at harvest (lb/A)[u]	Sucrose reduction (%)[t]	ERS after storage (lb/A)
C-29	1.7 h-k	10	5 c-g	5.0 c-h	40.79 a	12,677 a	28 n-r	9,170 a
HM106607	2.1 c-j	10	5 c-g	5.2 b-g	38.28 a-f	11,860 a-f	24 r	9,068 ab
B-105	2.2 b-i	11	6 c-g	6.1 a-d	39.40 a-d	12,255 a-d	27 o-r	8,963 a-c
HM108683	2.1 c-j	12	6 c-g	5.8 a-e	39.73 a-c	12,446 ab	29 l-r	8,845 a-d
B-103	2.1 c-j	6	3 e-g	3.9 f-h	36.03 d-j	11,322 c-j	23 r	8,723 a-e
HM105187	2.2 b-i	19	5 c-g	6.3 a-d	37.92 a-g	11,836 a-f	26 o-r	8,698 a-e
HM070017	1.6 i-k	6	6 c-g	5.2 b-g	37.64 a-h	11,768 a-g	28 m-r	8,472 a-f
HM103650	2.1 c-j	5	3 e-g	4.2 e-h	37.45 a-h	11,284 c-j	25 p-r	8,464 a-f
HM080004	2.0 c-k	4	3 e-g	5.7 a-f	38.09 a-g	11,593 a-h	28 m-r	8,310 a-f
HM080006	2.4 a-g	11	10 b-e	6.6 a-c	40.15 ab	12,160 a-e	32 i-p	8,281 a-g
B-108	2.4 a-f	11	6 c-g	5.9 a-e	40.18 ab	12,322 a-c	34 g-o	8,128 a-h
SX014	2.2 b-i	13	7 c-g	4.9 c-h	38.76 a-e	11,231 d-k	29 l-r	7,971 b-h
HM104439	1.8 f-k	4	1 g	5.5 a-g	34.24 h-k	10,615 h-m	25 p-r	7,963 b-h
C-201	2.2 b-i	10	4 c-g	3.1 h	34.91 f-k	10,749 g-m	27 o-r	7,877 c-i
B-100	1.5 jk	21	9 b-g	5.9 a-e	37.73 a-h	11,992 a-f	35 g-n	7,840 c-i
HM109709	1.8 g-k	6	2 fg	4.5 d-h	33.52 i-k	10,315 j-n	24 qr	7,830 c-i
C-208	2.2 b-i	20	7 c-g	5.6 a-g	37.66 a-h	11,266 c-j	30 k-r	7,823 c-i
HM105546	2.8 ab	7	5 c-g	3.7 gh	39.42 a-d	11,546 b-h	32 i-p	7,816 c-i
HM080011	2.4 a-g	22	4 c-g	6.0 a-e	33.52 i-k	10,618 h-m	27 o-r	7,758 d-i
SV007	2.3 b-h	11	4 d-g	4.8 c-h	33.31 jk	10,716 g-m	29 m-r	7,640 e-j
C-204	2.1 c-j	13	8 c-g	5.5 a-g	40.01 ab	11,947 a-f	38 e-k	7,486 f-k
B-110	2.3 b-h	28	12 a-d	6.6 a-c	36.94 b-i	10,926 f-m	31 j-q	7,480 f-k
B-5	2.1 c-j	13	3 e-g	6.2 a-d	37.86 a-g	12,258 a-d	39 c-i	7,463 f-k
B-109	1.8 f-k	10	5 c-g	5.6 a-g	32.99 jk	10,403 i-m	28 m-r	7,447 f-k
C-12	1.8 g-k	4	9 b-g	4.9 c-h	40.01 ab	11,732 a-g	37 f-l	7,434 f-l
C-28	1.9 d-k	27	9 b-g	7.1 a	36.16 d-j	11,427 b-i	35 f-m	7,402 f-l
SV001	2.6 a-d	17	12 a-d	5.9 a-e	38.84 a-e	11,895 a-f	38 d-j	7,350 f-l
B-102	2.1 c-j	4	6 c-g	6.2 a-d	35.54 e-j	10,963 f-m	35 g-n	7,152 g-m
B-101	3.0 a	20	9 b-g	6.1 a-e	33.52 i-k	10,429 i-m	32 i-p	7,109 h-m
HM105483	1.4 k	20	8 c-g	6.0 a-e	35.22 f-k	10,162 k-n	34 h-o	6,765 i-n
SV006	1.9 d-k	25	10 b-f	6.0 a-e	38.06 a-g	11,929 a-f	46 b-d	6,511 j-o
HM080001	2.4 a-g	11	6 c-g	5.0 c-g	36.42 c-j	11,086 e-l	42 c-g	6,491 j-o
SX013	1.9 f-k	29	10 b-f	6.7 a-c	34.88 f-k	11,095 e-l	42 c-f	6,473 k-o
SV008	1.9 f-k	22	6 c-g	5.8 a-f	31.85 k	9,991 mn	37 f-k	6,290 l-o
HM102064	1.9 f-k	11	3 e-g	6.0 a-e	34.63 g-k	10,426 i-m	41 c-h	6,142 m-o
HM103425	2.5 a-e	19	12 a-c	7.0 ab	40.54 a	12,132 a-e	53 ab	5,738 no
SV003	2.4 a-g	17	16 ab	6.6 a-c	33.55 i-k	10,025 l-n	45 c-e	5,510 o
HH015	2.6 a-c	30	10 b-e	6.6 a-c	34.28 h-k	10,171 k-n	47 bc	5,463 o
SV009	2.1 c-j	20	20 a	6.9 ab	31.82 k	9,230 n	57 a	3,963 p
Overall mean	2.1	14	7	5.7	36.71	11,251	34	7,469
$P > F$[s]	0.0008	0.1164	0.0113	0.0060	<0.0001	<0.0001	<0.0001	<0.0001
LSD ($P \leq 0.05$)	0.6	NS	8	1.9	3.5	1,086	8	1,152

[z] For more information on coded cultivars contact the respective companies: B = Betaseed, C = ACH Seeds Inc., HH = Holly Hybrids, HM = Hilleshog, SX = Seedex, and SV = SESVanderHave. The five commercial check cultivars (bold type) were B-5, B-103, C-12, HH015, and HM070017.

[y] Rz rating = roots were evaluated for rhizomania using a scale of 0-9 (0 = healthy, 9 = dead; Plant Dis. 92:581-587) at harvest.

[x] Surface fungal growth = percentage of root area covered by fungal growth.

[w] Surface root rot = percentage of root surface area discolored.

[v] Weight reduction = difference in weight from harvest to end of storage.

[u] 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)]).

[t] Sucrose reduction (%) = (1-(((% $Sucrose_{storage\ sample}$ – 1.395) x $Weight_{storage\ sample}$)/(% $Sucrose_{harvest\ sample}$ x $Weight_{harvest\ sample}$))) x 100.

[s] *P* > *F* was the probability associated with the F value. LSD = Fisher's protected least significant difference value. Within each variable, means followed by the same letter did not differ significantly based on Fisher's protected least significant difference. NS = not significantly different.