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, 2011.

Twenty-four experimental sugar beet cultivars and five commercial check 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 to 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 ($\alpha = 0.05$) was used for mean comparisons.

Root rots and 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, B-103. All experimental cultivars appeared to have acceptable levels of rhizomania resistance based on both foliar and root ratings. Root yield averaged 33.4 tons/A which was a little lower than Idaho's average of 34.4 tons/A (USDA-National Ag. Stat. Service). Surface root rot ranged from 2 to 37%, 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). By the end of the storage season, weight loss ranged from 5.2 to 13.8% and sucrose losses ranged from 18.9 to 63.2%. Given the range of responses, selecting cultivars for rhizomania resistance and storability will lead to considerable economic benefit for the sugar beet industry.

Cultivar[u]	Rhizomania rating[t]		Surface root rot (%)[v]	Weight reduction (%)[w]	Root yield (tons/A)	ERS at harvest (lb/A)[x]	Sucrose reduction (%)[y]	ERS after storage (lb/A)
	Foliar (%)	Root						
B-7	2 c	2.3 g-j	5.2 ef	5.6 hi	35.3 ab	9,522 b-e	18.9 k	7,723 a
C-32	0 e	2.4 d-i	3.8 f	7.7 c-h	33.1 a-c	9,625 b-e	24.8 jk	7,240 ab
C-27	1 d	2.1 j	3.5 f	6.8 e-i	38.3 a	11,515 a	38.2 c-f	7,121 a-c
C-33	0 e	2.6 b-f	3.8 f	6.1 g-i	35.1 a-c	10,471 a-d	32.5 e-j	7,069 a-d
HM126648	1 d	2.4 e-j	5.0 ef	5.2 i	35.0 a-c	9,856 a-e	28.3 g-j	7,048 a-d
M125594	1 d	2.6 b-f	8.2 c-f	6.2 f-i	37.8 a	10,554 a-d	33.3 e-j	7,009 a-d
M126594	0 e	2.6 b-f	3.0 f	7.6 c-h	32.1 a-c	9,218 c-e	26.2 h-k	6,813 a-d
HM124268	1 d	2.6 b-e	11.2 c-f	7.5 d-h	36.8 ab	10,315 a-d	34.5 d-i	6,782 a-d
HM123449	0 e	2.8 b	4.8 ef	8.3 c-f	36.4 ab	11,162 ab	40.1 b-f	6,697 a-d
C-29	0 e	2.4 d-i	2.5 f	6.0 g-i	31.3 b-d	9,043 c-e	25.9 i-k	6,664 a-d
SV012	1 d	2.2 h-j	15.2 b-d	7.3 d-i	35.4 ab	9,866 a-e	31.7 f-i	6,654 a-d
HM124567	0 e	2.5 c-g	7.0 c-f	8.9 c-e	36.0 ab	11,244 ab	41.4 b-e	6,594 a-e
HM125891	0 e	2.4 c-i	7.5 c-f	7.7 c-h	38.2 a	11,551 a	43.1 b-d	6,593 a-e
HM122896	3 b	2.5 b-g	2.5 f	7.6 c-h	33.6 a-c	10,502 a-d	37.1 c-g	6,587 a-f
SX018	1 d	2.5 c-h	7.5 c-f	7.7 c-h	34.6 a-c	9,782 a-e	34.8 d-i	6,434 a-f
HM080006	1 d	2.6 b-e	8.8 c-f	9.8 bc	33.4 a-c	9,478 b-e	33.3 e-j	6,302 a-f
B-46	0 e	2.3 g-j	6.5 d-f	8.2 c-g	32.4 a-c	9,751 a-e	37.0 c-g	6,110 b-g
SV013	2 c	2.3 g-j	7.2 c-f	6.6 f-i	34.9 a-c	9,724 a-e	38.0 c-f	5,942 b-g
M124896	3 b	2.3 f-j	3.5 f	13.8 a	34.5 a-c	10,670 a-c	44.3 bc	5,934 b-g
HM123367	1 d	2.3 g-j	14.2 b-e	9.1 b-d	36.1 ab	9,810 a-e	40.8 b-e	5,821 b-g
SX020	1 d	2.4 d-i	11.0 c-f	6.9 d-i	35.6 ab	11,130 ab	47.6 b	5,804 b-g
SX019	1 d	2.3 g-j	8.8 c-f	6.9 d-i	32.2 a-c	9,009 c-e	36.6 c-g	5,712 c-g
HM126457	0 e	2.7 bc	4.2 f	6.4 f-i	31.5 b-d	8,758 d-f	35.0 d-g	5,662 d-g
B-47	2 c	2.2 ij	3.8 f	7.2 d-i	30.8 b-d	9,187 c-e	43.1 b-d	5,198 e-h
HM125594	2 c	2.7 b-d	4.5 ef	7.9 c-g	29.0 cd	8,005 ef	35.6 c-g	5,141 f-i
HH016	2 c	2.5 c-h	16.5 bc	7.5 d-h	25.4 d	7,105 f	33.2 e-j	4,742 g-i
HM129645	3 b	2.2 h-j	37.0 a	9.0 c-e	36.2 ab	10,710 a-c	61.4 a	4,166 hi
HM123684	0 e	2.1 j	22.2 b	6.8 e-i	33.9 a-c	9,583 b-e	63.2 a	3,693 i
B-103	100 a	4.1 a	16.2 b-d	11.3 b	12.5 e	2,875 g	47.9 b	1,502 j
Overall mean	4	2.5	8.8	7.7	33.4	9,656	37.5	6,026
$P > F^z$	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD	1	0.3	9.8	2.2	6.2	1,874	9.0	1,448

[t] 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.

[u] For more information on coded cultivars, contact the following companies: B = Betaseed Inc., C = ACH Seeds Inc., HH = Holly Hybrids, HM = Hilleshog, M = Maribo, SV = SESVanderHave, and SX = Seedex. Check cultivars (bold) were B-103 (rhizomania susceptible check), HH016 (storage susceptible check), B-7 (commercial check), C-29 (commercial check), and HM080006 (commercial check).

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

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

[x] 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)]).

[y] Sucrose reduction (%) = (1-(((% $\text{Sucrose}_{\text{storage sample}}$ – 1.395) x $\text{Weight}_{\text{storage sample}}$)/(% $\text{Sucrose}_{\text{harvest sample}}$ x $\text{Weight}_{\text{harvest sample}}$))) x 100.

[z] *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; $\alpha = 0.05$).