SUGAR BEET (*Beta vulgaris*)
Rhizomania; *Beet necrotic yellow vein virus*
Basidiomycete

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Commercial sugar beet cultivars evaluated for rhizomania resistance and storability in Idaho, 2008.

Eighteen commercial sugar beet cultivars were evaluated in a commercial sprinkler-irrigated sugar beet field near Jerome, ID where winter wheat was grown in 2007. The field trial relied on natural infection for rhizomania development. The plots were planted on 22 Apr 08 to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 30 May. Plots were four rows (22-in. row spacing) and 34.5 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 roots were mechanically topped and the center two rows were collected with a mechanical harvester on 9 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 on 9 Oct set to hold 35°F. On 29 Jan 09, the roots were evaluated for the percentage of surface area covered by fungal growth (an undescribed basidiomycete that correlates with sucrose loss in storage). On 2 Feb 09 roots were retrieved after 115 days in storage and evaluated for weight and percent sucrose (via gas chromatography). To establish percent reduction in sucrose at harvest versus storage only samples from the same plots were compared. Data were analyzed using the general linear models procedure (Proc GLM-SAS), and Fisher's protected least significant difference was used for mean comparisons.

Rhizomania was uniform throughout the plot area. Root rots and other disease problems were not evident in the plot area. Root yield averaged 44 tons/A which was higher than Idaho's average of 31 tons/A (USDA-National Ag. Stat. Service). There were significant differences among cultivars for all variables except Rz rating and weight reduction. All cultivars possessed at least the *Rz1* gene for resistance to *Beet necrotic yellow vein virus*, so finding no differences for the Rz rating was not surprising. Surface fungal growth got started in Nov 08 and ranged from 7 to 75% by 29 Jan 09 depending on cultivar. By the end of the storage season, sucrose losses ranged from 45 to 66%. 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)
B-11	2.8	10 f	8 cd	7.1	44.4 a-d	13748 a	47 c-e	7440 a
HM080012	2.1	26 d-f	8 cd	10.8	45.3 a-d	13453 a-c	45 e	7325 a
C-11	2.6	18 ef	16 b-d	8.7	45.0 a-d	13514 a-c	47 de	7277 a
SX010	2.4	15 ef	12 cd	8.1	42.9 cd	12499 cd	45 e	6764 ab
HM070017	2.3	7 f	6 d	9.0	42.1 d	12592 b-d	50 b-e	6392 a-c
B-34	2.4	14 f	5 d	11.1	46.7 a	13161 a-d	56 a-e	5882 a-d
B-13	2.2	47 b-d	21 b-d	7.5	46.7 a	13692 ab	57 a-e	5797 a-d
B-14	1.9	9 f	16 b-d	10.2	44.1 a-d	12470 cd	54 a-e	5596 a-d
B-5	1.5	23 d-f	28 bc	11.7	46.4 ab	13880 a	63 ab	5232 b-d
B-35	2.8	58 ab	36 ab	10.3	45.9 a-c	12532 cd	57 a-e	5204 b-d
C-12	2.4	28 d-f	13 cd	9.2	43.6 a-d	13076 a-d	60 a-d	5193 b-d
HM070020	2.1	7 f	18 b-d	10.3	44.9 a-d	13166 a-d	61 ab	5110 b-d
HH017	2.6	42 e	13 cd	10.8	43.8 a-d	13010 a-d	61 ab	5102 b-d
B-23	1.8	18 ef	13 cd	11.1	43.3 b-d	12575 b-d	60 a-c	4948 b-d
HH016	3.1	31 c-f	18 b-d	10.2	37.5 e	10687 e	57 a-e	4710 cd
B-21	2.1	75 a	53 a	13.5	44.7 a-d	12789 a-d	64 a	4649 cd
C-10	2.7	18 ef	20 b-d	12.2	42.6 d	12977 a-d	65 a	4350 d
HH015	2.3	56 a-c	35 ab	12.0	42.7 cd	12284 d	66 a	4286 d
Overall mean	2.3	28	19	10.2	44.0	12892	56	5625
$P > F$[s]	0.0975	<0.0001	0.0028	0.2816	0.0002	0.0005	0.0243	0.0099
LSD ($P \leq 0.05$)	NS	27	21	NS	3.2	1154	14	1889

[z] For more information on coded cultivars contact the respective companies: B = Betaseed, C = ACH Seeds Inc., HH = Holly Hybrids, HM = Hilleshog, and SX = Seedex.

[y] Rz rating = roots were evaluated for rhizomania using a scale of 0-9 (0 = healthy, 9 = dead) at harvest.

[x] Surface fungal growth = percentage of root area covered by fungal growth from an undescribed basidiomycete.

[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-(((% $\text{Sucrose}_{\text{storage sample}}$ − 1.395) x $\text{Weight}_{\text{storage sample}}$)/(% $\text{Sucrose}_{\text{harvest sample}}$ x $\text{Weight}_{\text{harvest sample}}$))) x 100.

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