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

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

Thirty-five experimental and four commercial check 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 symptoms were 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 weight reduction. All cultivars should have possessed at least the *Rz1* gene for resistance to *Beet necrotic yellow vein virus*, but some cultivars appeared to be segregating for this trait. The six cultivars with an Rz rating over 3.0 should be monitored closely in the future for the lack of sufficient rhizomania resistance. Surface fungal growth got started in Nov 08 and ranged from 7 to 74% by 29 Jan 09 depending on cultivar. By the end of the storage season, sucrose losses ranged from 43 to 76%. Thus, improving storability to reduce sucrose losses in sugar beet cultivars 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)
HM080013	2.6 c-g	14 gh	11 d-f	8.3	43.1 d-h	12721 b-h	43 h	7292 a
B-40	2.2 d-i	22 e-h	15 d-f	8.8	44.4 b-g	13713 a-e	47 e-h	7255 a
C-29	2.1 e-i	52 a-d	17 c-f	8.6	45.2 a-f	13961 ab	48 d-h	7155 a
B-37	2.6 c-f	20 e-h	12 d-f	8.8	42.7 e-h	13100 a-h	45 gh	7048 a
HM070006	2.0 f-i	16 gh	11 d-f	9.5	45.2 a-f	13662 a-f	49 d-h	7011 a
B-39	3.1 a-c	14 gh	6 f	10.5	40.8 hi	12376 f-h	44 gh	6978 a
C-12	2.3 d-h	30 c-h	16 d-f	9.4	43.2 c-h	12848 a-h	48 e-h	6750 ab
HM080003	2.2 d-i	13 gh	5 f	9.7	47.0 ab	13723 a-e	51 d-h	6733 ab
HM070017	1.9 g-i	19 f-h	7 ef	7.9	40.9 hi	12189 gh	47 f-h	6590 a-c
SV002	2.8 b-d	41 b-g	18 c-f	8.4	43.5 c-h	13088 a-h	51 d-h	6401 a-c
C-24	3.1 a-c	20 e-h	6 f	6.7	40.5 hi	12836 a-h	51 d-h	6376 a-c
C-28	2.2 d-i	34 c-h	14 d-f	8.2	43.2 c-h	13866 a-c	54 b-h	6325 a-d
HM070022	2.6 c-f	42 b-g	17 c-f	10.2	43.7 c-h	13208 a-g	53 c-h	6278 a-d

C-19	2.6 c-g	14 gh	11 d-f	8.5	44.3 b-g	13797 a-d	55 a-h	6254 a-d
HM080010	2.3 d-h	16 gh	17 c-f	10.9	41.3 g-i	12165 h	51 d-h	6050 a-e
C-25	1.9 hi	26 d-h	24 a-f	7.9	47.0 ab	14060 a	58 a-h	5981 a-f
HM080004	2.2 d-i	38 c-g	18 c-f	10.6	43.6 c-h	12655 c-h	54 b-h	5796 a-f
HM080002	2.1 e-i	16 gh	5 f	7.9	41.9 gh	12522 d-h	56 a-h	5684 a-f
SV004	3.1 a-c	16 gh	11 d-f	7.3	41.3 g-i	12179 gh	55 a-h	5653 a-f
SX011	2.2 d-i	68 ab	12 d-f	9.2	43.4 c-h	12833 a-h	56 a-h	5586 a-f
HM080006	2.7 b-e	14 gh	21 b-f	12.1	45.4 a-f	13468 a-g	61 a-h	5355 a-f
B-7	2.1 f-i	16 gh	9 d-f	9.1	43.3 c-h	14020 a	63 a-h	5273 a-g
HM080005	2.7 b-e	22 d-h	13 d-f	7.0	42.2 f-h	12582 c-h	58 a-h	5252 a-g
C-4	3.3 ab	23 d-h	22 b-f	10.8	43.2 c-h	12764 a-h	60 a-h	5242 a-g
B-38	1.6 i	52 a-d	20 b-f	10.9	46.3 a-c	13698 a-e	63 a-h	5144 a-g
C-26	2.6 c-g	18 f-h	11 d-f	10.2	42.9 d-h	13284 a-g	61 a-h	5077 a-g
B-21	3.5 a	36 c-h	22 b-f	10.8	45.5 a-e	13195 a-h	63 a-h	4880 a-g
C-27	1.6 i	21 e-h	18 c-f	11.2	47.7 a	13832 a-c	64 a-g	4841 a-g
SX013	2.4 d-h	74 a	27 a-d	8.5	44.3 b-g	13583 a-f	64 a-g	4765 a-g
SV001	2.1 e-i	14 gh	14 d-f	11.0	43.7 c-h	12922 a-h	62 a-h	4621 a-g
HH015	2.4 d-h	68 ab	36 a-c	10.0	45.9 a-e	13288 a-h	65 a-g	4558 a-g
HM080007	2.7 b-e	7 h	39 ab	12.9	41.4 gh	12425 e-h	67 a-f	4005 b-g
HM080011	2.4 d-h	20 e-g	27 a-e	10.7	40.9 hi	12778 a-h	69 a-d	3816 c-g
SV003	2.6 c-f	43 a-g	28 a-d	12.5	46.0 a-d	13704 a-e	73 a-c	3523 d-g
HM080001	1.9 g-i	48 a-f	39 ab	11.7	48.0 a	13834 a-c	76 a	3520 d-g
SV005	2.4 d-h	59 a-c	22 b-f	9.5	38.0 ij	10710 i	68 a-e	3504 d-g
HM080008	2.2 d-i	39 b-g	29 a-d	11.5	43.2 c-h	12765 a-h	74 a-c	3304 e-g
HM080009	2.6 c-f	41 b-g	44 a	11.5	45.6 a-e	13310 a-h	75 a	3200 fg
SX012	3.5 a	50 a-e	28 a-d	13.6	35.2 j	9946 i	75 ab	2494 g
Overall mean	2.5	31	19	9.8	43.5	13015	58	5425
$P > F$[s]	<0.0001	<0.0001	0.0035	0.0794	<0.0001	<0.0001	0.0437	0.0226
LSD ($P \leq 0.05$)	0.7	29	20	NS	3.2	1299	21	2821

[z] For more information on coded cultivars contact the respective companies: B = Betaseed, C = ACH Seeds Inc., HH = Holly Hybrids, HM = Hilleshog, SV = SESVanderHave, and SX = Seedex. Commercial check cultivars (in bold) were B-21, C-12, HH015, and HM070017.

[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.