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

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Sugar beet germplasm evaluated for resistance to rhizomania and storability in Idaho, 2007.

Sugar beet germplasm and commercial check cultivars were evaluated in a commercial sprinkler-irrigated sugar beet field near Rupert, ID where winter wheat was grown in 2006. The field trial relied on natural inoculum for rhizomania development. The seed was treated with clothianidin (2.1 oz a.i. per 100,000 seed) to limit the influence of pests and curly top. The plots were planted on 3 Apr to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 23 May. Plots were single rows (22-in. row spacing) and 10 ft long. The experimental design was a randomized complete block design with eight replications per entry. The field was cultivated on 24 May and 15 Jun. The crop was managed by the grower according to standard cultural practices. The roots were mechanically topped and lifted on 27 Sep. The first ten roots in each plot were evaluated using a scale of 0-9 (0 = healthy and 9 = dead). The first eight roots were placed in a mesh onion bag and held in an indoor commercial sugar beet storage facility set to hold 35°F. On 1 Feb 2008, the roots were evaluated for the percentage of surface area covered by fungal growth (an undescribed Basidiomycete that correlates with sugar loss in 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.

Rhizomania was uniform throughout the plot area and the surrounding commercial field with *Rz1* resistance had no susceptible looking plants (no evidence of resistance breaking down). Root rots and other disease and pest problems were not evident in the plot area. The commercial checks responded as expected for Roberta (susceptible), Beta 4430R (resistant), and Angelina (resistant). Beta G017R did not perform as well as expected in this field as it has in previous studies and may be an indication that *Rz2* was partially defeated (this would be the first field evidence of this or *Rz2* alone is not as strong a gene as *Rz1* alone). Entries thought to be susceptible were not significantly different from the susceptible check, Roberta, except for Z510. Entries thought to contain at least *Rz1* were not significantly different from the *Rz1* check, Beta 4430R, except for 6849 (found to be mostly susceptible at Salinas, low frequency *Rz1*) and P618. Some entries (R624/5, R640, R622, and R637) with unknown or previously untested responses performed similar to the *Rz1* check. To rate well in the storage assay, lines must possess both rhizomania resistance and storability (fungal growth correlated with sugar loss in other storage studies). Lines 4931, Y692, and R624/5 appear to possess both good rhizomania resistance and storability.

Entry[z]	Identification	Description	RZ DSI	Storage (%)
5	EL-SP7322-0	*rzrz*, Inc. SP7322-0 (Aphanomyces resistant, CR)	32.4 a	28 h-k
2	Roberta	*rzrz*, Susceptible commercial check	30.7 ab	55 a-k
35	R623	Rz?, IV-BNYVV R523, R523B, R520 (Bvm)..	29.6 a-c	56 a-j
13	05-US75	*rzrz*, Inc. 03-US75	29.3 a-d	45 c-k
10	P618	*Rz1,* PMR P518-6, CP08	29.0 a-e	38 e-k
36	05-US22/3	*rzrz*, Inc. 02-US22/3 (CTR).....	27.8 a-f	85 ab
46	6849	Low Freq.*Rz1,* mm, T-O 5849#(c)(A,aa), (%S x CTR)	26.4 b-g	80 a-d
21	06-C37	*rzrz*, Inc. 04-C37 (recurrent parent for R624/5,R640,R637)	26.1 b-h	44 d-k
20	Z510	*rzrz*, Inc. Z210 (%S Polish germplasm)	25.3 c-i	45 c-k
22	P627	*Rz1,* PMR P527, CP03, (C37*Pm*).....	24.8 d-j	49 b-k
42	N472	*Rz1,* N372, N272-#(c)aa x A, CN72	24.7 d-j	63 a-i
4	BetaG017R	*Rz2*, Resistant commercial check	24.4 e-j	53 a-k
48	EL-C869	*Rz1*, C869mmaa x A, C869, (*Rz1* x mmCTR) .	24.3 e-j	31 g-k
11	P631CT	*Rz1*, PMR-NR-RZM-ER P431CT, CP09CT	24.2 e-j	51 a-k
23	P628	*Rz1*, PMR P528, CP04, (C37*Pm*).....	23.6 f-k	64 a-i

14	Y639	Quantitative, Inc. R539, C39R	23.6 f-k	34 f-k
38	5944	*Rz1*, Syn1, (C1,C2,C3) aa x A.....	23.6 f-k	50 b-k
41	N412	*Rz1*, N312, N212-#(c) aa x A, CN12	23.5 f-k	40 e-k
9	P607	*Rz1*, PMR P507/8, CP07	23.1 f-l	54 a-k
30	R626	Rz?, IV-BNYVV R524, R525, R537.....	23.1 f-l	42 d-k
6	R578	*Rz1*, Inc. R378, C78/3	23.0 g-l	50 b-k
40	Z425	*Rz1*, Z325 aa x A, CZ25/2, (CTR x %S).....	22.8 g-l	48 b-k
15	Y691	*Rz1*, Y491-#(c), FS, C2, Syn2, (CY91).....	22.8 g-l	71 a-f
32	R541/2	Rz?, IV-BNYVV R641, R642, (WB169,WB258)	22.8 g-l	27 i-k
33	R621	Rz?, IV-BNYVV R521, R421, (C51 x (C26 x C27))	22.6 g-l	52 a-k
7	P629	*Rz1*, PMR P529, CP05, (C78*Pm*).....	22.5 g-l	84 a-c
45	6851	*Rz1*, mm, T-O 5851-#(c)(A,aa),(%S x CTR)	22.5 g-l	67 a-h
16	Y690	*Rz1*, RZM-ER-% Y390	22.4 g-l	90 a
39	6943	*Rz1*, popn-943(c) aa x A, (CTR x %S).....	22.2 g-l	32 f-k
29	R637	Rz?, IV-BNYVV R437, (C79-9,WB151).....	22.2 g-l	66 a-h
34	R622	Rz?, IV-BNYVV R522, (C51, SB x Bvm)	21.8 g-l	32 f-k
44	06-FC1020	*Rz1*, 05-FC1022, 1018, 1019, (C931 x FC Rhizoc)	21.7 g-l	34 f-k
8	P630	*Rz1*, PMR P530, CP06, (C78*Pm*).....	21.7 g-l	74 a-e
19	Y595	*Rz1*, RZM Y95 (FS, C1, Syn1)	21.4 h-l	35 e-k
47	5842	*Rz1*, 4842 mmaa x A, C842, (*Rz1* x CTR)	21.4 h-l	58 a-j
12	Y577	*Rz1*, IV-BNYVV-% Y277, Y375 (Rz1 x Bvm)	21.3 h-l	70 a-g
1	Beta4430R	*Rz1*, Resistant commercial check	20.9 i-l	42 d-k
24	R640	Rz?, IV-BNYVV R540, R340, (C79-#s)	20.8 i-l	64 a-i
3	Angelina	*Rz1* + *Rz2*, Resistant commercial check.....	20.6 i-l	61 a-j
18	Y693	*Rz1*, RZM-ER-% Y393, (FS, C2, Syn1)	20.3 j-l	46 b-k
17	Y692	*Rz1*, RZM-ER-% Y492	20.2 j-l	23 jk
31	R624/5	Rz?, IV-BNYVV R424/5, R525, (WB41,WB42)	20.2 j-l	25 i-k
37	4931	*Rz1*, 3931 aa x A, C931.....	19.4 kl	16 k
43	06-FC1036	*Rz1*, RZM-CR-% 04-FC1028,1037,1038, (Rz1 x LSR)	18.3 l	58 a-j
P > *F*			<0.0001	0.0243
LSD (*P* ≤ 0.05)			4.8	39

[z] Sugar beet germplasm lines developed at Salinas, CA were evaluated for response to *Beet necrotic yellow vein virus* along with commercial checks. The material was evaluated using a scale of 0-9 (0 = healthy, 9 = dead) to rate 10 roots in each plot. These data were used to establish a disease severity index (RZ DSI) for each plot using the following formula: [((A)0+(B)1+(C)2+(D)3+(E)4+(F)5+(G)6+(H)7+(I)8+(J)9)/90]100, where A-J are plants in categories 0-9, respectively. Storage = percentage of root area covered by fungal growth from an undescribed basidiomycete. *P* > *F* was the probability associated with the F value. LSD = Fisher's protected least significant difference value. Means followed by the same letter did not differ significantly based on Fisher's protected least significant difference. WB = wild beet, CR = tolerant to Cercospora leaf spot, CTR = curly top resistant, PMR = selected or resistant to powdery mildew, Rz? = rhizomania resistance level unknown, and *Rz1* = presence of *Rz1* but frequency is likely not 100%. *rzrz* = no rhizomania resistance.