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

A. Eujayl and C. A. Strausbaugh,
USDA-ARS NWISRL,
3793 N. 3600 E., Kimberly, ID 83341.

Evaluation of sugar beet germplasm and plant introductions response to rhizomania and storability in Idaho, 2008

Sugar beet germplasm, wild beta, and commercial check cultivars were evaluated in a commercial field (near Declo, ID). This field was sprinkler-irrigated and winter wheat was grown in the previous year. 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 15 Apr 08 to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 12 Jun. 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 13 Jun 08. The crop was managed by the grower according to standard cultural practices. The roots were mechanically topped and lifted on 29 Sep 08. The first ten roots in each plot were scored for disease severity index (DSI) using a scale of 0-9 (0 = healthy and 9 = dead). To evaluate germplasm for storability, eight roots from each plot from 4 replications were placed in a mesh onion bag and held in an indoor commercial sugar beet storage facility set to hold 35°F for 90 days (until 1 Feb 09). 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.

The weather conditions were not ideal for crop establishment and rhizomania development, as cold weather prevailed during the spring 08. However, later in the season rhizomania infection levels were uniform throughout the experimental plots and there were no obvious rhizomania symptoms (blinkers) in the surrounding commercial fields as well as there were no evidences of resistance breaking-down in the area. Root rots and other diseases and pest problems were not observed in the plot area. Rhizomania leaf yellowing and upright growth symptoms were obvious in the susceptible check. The checks responded as expected for US75 (susceptible), Beta 4430R (*Rz1* resistant check), and Angelina (*Rz1*+ *Rz2* resistant check). Beta G017R (*Rz2* resistant check) was intermediate as expected. Several entries were susceptible and their DSI were not significantly different from that of the susceptible check (US75). Reactions of several accessions including KC1036 and KP731 were not significantly different from the *Rz1* check. Additionally, accessions K0848 (*Beta v. maritima*) and K0843 (*Beta webbiana*) were evaluated for the first time in the field and performed similar to the *Rz1* and *Rz1*+*Rz2* resistant checks, respectively. These two accessions were tested in the greenhouse and performed similarly. The storability rating based on the percentage of root surface area covered with fungal growth is not directly correlated to DSI, as evident in the susceptible or the resistant check. In previous studies, fungal growth was found to be correlated with sucrose loss. In this study accession KC4931 showed both rhizomania resistance and a significantly lower percentage area covered with fungal growth. Two of the accessions that showed high resistance (KC1036) and lowest fungal growth (KC7322) were selected from 07 field screening of advanced USDA germplasm. The relationship between rhizomania resistance and fungal growth is apparently complicated as shown in the performance of entries KC4931and KC1036.

Entry No. [z]	Identification	Description	RZ DSI [y]	Storage (%)[x]
1	US75	*rzrz*, susceptible check	27.2 a	68 a-d
2	KC600	*B. vulgaris vulgaris* MM, S^f.	25.4 ab	100 a
3	KWB723	*B. vulgaris maritima*, *Rz*1 resistant, CA- USA	24.6 ab	48 cd
4	KC7322	*B. vulgaris vulgaris*	22.9 a-c	42 d
5	KN472	*B. vulgaris vulgaris*, nematode resistant	22.3 a-d	88 a-c
6	KC7944	*B. vulgaris vulgaris, Rz*1, MM, S^f, CA , USA	22.3 a-d	74 a-d
7	K0833	*B. vulgaris maritima,*PI54638, Spain	22.2 a-d	ND
8	BetaG017R	*Rz2*, resistant commercial check	21.3 a-e	60 a-b
9	K0848	*B. vulgaris maritima,* PI546397, Denmark	20.3 b-e	ND
10	KC869	*B. vulgaris vulgaris*	20.0 b-e	92 ab
11	KP731	*B. vulgaris vulgaris*	19.7 b-e	73 a-d
12	K0843	*Beta webbiana*, PI564064, CA- USA	19.4 b-e	ND
13	KC4931	*B. vulgaris vulgaris*	19.1 b-e	45 d
14	KC1036	*B. vulgaris vulgaris*	17.3 c-e	90 ab
15	Beta4430R	*Rz1*, resistant commercial check	15.7 de	95 ab
16	Angelina	*Rz1* + *Rz2*, resistant commercial check	15.1 e	95 ab
P > *F*			0.0339	0.0316
LSD ($P \leq 0.05$)			6.8	39

[z] Plant introductions and germplasm accessions were evaluated for response to *Beet necrotic yellow vein virus* along with commercial checks.
[y] 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.
[x] Storage = percentage of root area covered by fungal growth from an un-described basidiomycete.
P > *F* 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.
ND = not enough roots to obtain storage data.