
Thirty sugar beet (Beta vulgaris L.) Plant Introduction (PI) Lines from the USDA-ARS National Plant Germplasm System (NPGS), and four check cultivars were screened for resistance to Beet necrotic yellow vein virus (BNYVV), the causal agent of rhizomania, and to storage rot. The rhizomania evaluation was conducted at the USDA-ARS North Farm in Kimberly, ID which has Portneuf silt loam soil and had been in barley in 2017. In the spring the field was plowed and then fertilized (60 lb N and 110 lb P₂O₅/A) and roller harrowed on 5 Apr 18. The germplasm was planted (density of 142,560 seeds/A) on 25 Apr. The plots were one row 10-ft long with 22-in. between-row spacing and arranged in a randomized complete block design with 6 replicates. The crop was managed according to standard cultural practices for southern Idaho. Plant populations were thinned manually to 47,500 plants/A on 26 May. The trial relied on endemic field inoculum for rhizomania and storage rot development. The plots were rated for foliar symptom (percentage of plants with yellow, stunted, upright leaves) development on 7 Aug. The plants were mechanically topped and hand-harvested on 15 Oct. At harvest, ten roots per plot were rated for rhizomania symptom development using a scale of 0 to 9 (0 = healthy and 9 = dead; Plant Disease 93:632-638), with disease index (DI) treated as a continuous variable. At harvest, eight roots per plot were also placed in a mesh-onion bag and placed in an indoor commercial storage facility (temperature set point 34°F) in Paul, ID on 16 Oct. On 11 Feb 19, after 119 days in storage, the roots were evaluated for the percentage of root surface area (0 to 100%) covered by fungal growth and rot. Data were analyzed in SAS (Ver. 9.4) using the general linear models procedure (Proc GLM), and Fisher’s protected least significant difference (α = 0.05) was used for mean comparisons. The root ratings were rank transformed prior to analysis, but the non-transformed means have been presented in the table.

Rhizomania symptom development was uniform and other disease problems were not evident in the plot area. The BNYVV susceptible check (Check 1) had 97% foliar symptoms and a high root disease severity rating. The three resistant checks (2, 3, and 4) had 0 to 6% foliar symptoms and the lowest root ratings. Although the root ratings for entries 5 and 7 were not significantly different from the resistant checks, none of the PI Line entries had acceptable root ratings. Entries 3, 23, and 24 had foliar ratings that were better than the other PI Line entries indicating they may contain some level of resistance to BNYVV. The root ratings for these three entries may have been affected by poor inherent root shape and may not necessarily represent a lack of resistance to BNYVV. Entry 3 was the only entry that performed well for all three variables. Some of the entries may serve as a starting point for identifying additional sources of resistance to BNYVV and storage rots.
Four commercial cultivars were included as checks (bold). The description for the non-check entries includes the name, inventory number, and origin.

Root rot in storage = the percent of root surface area covered by fungal growth and rot. Fungal growth was dominated by an *Athelia*-like basidiomycete (Mycolgia 104:70-78), *Penicillium expansum*, and *Penicillium cellarum*. Some trace levels of *Botrytis cinerea* were also present.

Ten roots per plot were evaluated for rhizomania symptoms using a scale of 0-9 (0 = healthy and 9 = dead; Plant Disease 92:581-587). Root rating = a disease severity index value for each plot established using the following formula: 
\[
\frac{\left([A+(B)1+(C)2+(D)3+(E)4+(F)5+(G)6+(H)7+(I)8+(J)9]\times100\right)}{90}
\]
where A-J are the number of plants in categories 0-9, respectively. Trans = the root ratings were rank transformed prior to analysis, but the non-transformed means have been presented in the table.

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\*\*\*\* P > F was the probability associated with the F value. LSD = Fisher’s protected least significant difference value (\*\*\*\* \* = 0.05). Within a column, means followed by the same letter did not differ significantly based on Fisher’s protected LSD.