LEWELLEN, ROBERT T.[1], HSING-YEH LIU[1], ANNE M. GILLEN[2] and CARL A. STRAUSBAUGH[2], USDA, Agricultural Research Service, [1]1636 E. Alisal St., Salinas, CA 93905 and [2]3793 N. 3600 E., Kimberly, ID 83341. **Performance of rhizomania resistant sugarbeet under normal and resistance-breaking strains of *Beet necrotic yellow vein virus*.**

ABSTRACT

Rhizomania in sugarbeet (*Beta vulgaris*) is caused by *Beet necrotic yellow vein virus* (BNYVV). In current commercial cultivars, resistance to BNYVV is conditioned primarily by the allele *Rz1*. Since 2003, observations indicate that *Rz1* has been compromised by resistance-breaking strains of BNYVV (RB-BNYVV). A second resistance gene *Rz2* originally identified in *B. vulgaris* spp. *maritima* (WB42) appears to provide partial resistance to the resistance–breaking strains.

Sugarbeet cultivars with single and combinations of resistance genes were evaluated in baited plant greenhouse tests based on ELISA values. These cultivars and other experimental hybrids and breeding lines were evaluated in field trials at Salinas and Brawley, CA and Kimberly, ID under BNYVV noninfested and infested conditions. Infested conditions included both normal and RB-BNYVV strains.

The performance in the field substantiated the baited plant results. Significant interactions occurred for components of yield between cultivars (source of resistance) and strains of BNYVV. The *Rz1* allele gave a high level of protection against normal BNYVV but was defeated by the RB-BNYVV strains originating from the Imperial Valley of California. The *Rz2* allele either alone or in combination with *Rz1* provided partial resistance to the RB-BNYVV strains. The *Rz1* allele appeared to continue to provide some protection to losses caused by the resistance-breaking strains. However, this apparent partial protection may have been due to mixed normal and RB-BNYVV strains occurring in the field trials. The performance of the *Rz1* entry showed a continuous gradation from fully resistant to fully susceptible, depending upon the history and severity of the RB-BNYVV infestation. Resistance in C28 (C79-4) introgressed into sugarbeet from PI 206407 (resembling Swiss chard) did not condition resistance to RB-BNYVV. Resistance in WB41 introgressed into sugarbeet (C79-2) and reported to be *Rz3* conditioned partial resistance to all BNYVV strains tested. Quantitatively inherited resistance selected against normal strains also provided partial protection against losses to the resistance-breaking strain.

Because of the demonstrated vulnerability of single, major genes, the search is being continued for additional sources of resistance. A promising source is from WB151 and other *B. vulgaris* spp. *maritima* accessions and populations. At this time it is not known if the resistance conditioned by these sources from wild beet is the same or different from the known *Rz2* and *Rz3* factors.