TABLE BEET (*Beta vulgaris* 'Boro', 'Bazzu', 'Grenade', 'Manzu', 'Palau', 'Red Ace', 'Redval', 'XBE 7110')
Rhizomania; *Beet necrotic yellow vein virus*

E.S. Tippett, B.P. Werling, and M.K. Hausbeck
Michigan State University
Department of Plant, Soil and Microbial Sciences
East Lansing, MI 48824

Evaluation of table beet cultivars for resistance to Rhizomania caused by Beet necrotic yellow vein virus, 2022.

Rhizomania has historically been a devastating disease of sugar beets but was first reported infecting table beets in 2015 and 2016 in Brazil and South Africa, respectively, and here in Michigan in 2017. The causal agent of the disease is *Beet necrotic yellow vein virus* (BNYVV) which is vectored, or carried, by a fungal-like, soil-borne organism, *Polymyxa betae*. The observed symptoms associated with rhizomania on table beet include petiole proliferation, a misshaping of the taproot (giving it a "wineglass" shape), zoning (whitening of the vasculature tissue within the root), and excessive rootlet proliferation that can trap a large amount of soil. Unfortunately, there are no effective chemical control options for the vector or virus, so the sugar beet industry has relied on genetic resistance for control. The aim of our study is to determine if growing genetically resistant table beet cultivars can also aid in limiting this destructive disease on table beet production in Michigan.

The trial was established in muck soil at a grower cooperator's farm in Newaygo County, MI that was previously planted to field corn. Fertilization, weed, and insect control were managed by the grower cooperator to commercial production standards. Two Rhizomania-susceptible and six Rhizomania-resistant table beet cultivars were arranged in a completely randomized block design with four replications. In each replication, all cultivars were direct seeded in 217-ft long double rows with 6-in between single rows, and 1-ft buffers were included between each cultivar double row. Seeds were sown on 17 May and manually harvested with spading forks on 31 Aug. Upon harvest, petioles were removed with shears, and the roots were assessed for Rhizomania symptoms the day following harvest. A Rhizomania disease rating index was developed and included the following disease categories and distinguishing features: 0 - globe shaped root with no symptoms, 1 - globe shape with slightly hairy tap root, 2 – wine-glass shape with slightly hairy tap root, 3 – severe wine-glass shaped root with minor petiole scarring and minor bearding, 4 – severe wine-glass shaped root with severe petiole scarring and a significant beard, 5 – severe wine-glass shape to misshapen root with severe scarring and a heavy beard.

Statistical analysis was conducted with R software (v4.1.1). The rating data were analyzed using analysis of variance (ANOVA), with a mean separation performed using Fisher's least significant difference (LSD) t-test. All cultivars exhibited some level of disease. The Rhizomania-susceptible cultivars, Boro and Red Ace, had the highest average disease ratings which were significantly higher than all other cultivars in the study. The Rhizomania-resistant cultivars, Palau, Manzu, Bazzu, XBE7110, Grenade, and Redval, obtained scores ranging from 3.03 to 2.38, respectively. Redval had the best disease rating out of all the resistant cultivars.

Cultivar	Rhizomania resistance	Average Rhizomania disease rating (0-5)[z]
Boro	–[y]	4.45 a[w]
Red Ace	-	4.33 a
Palau	+[x]	3.03 b
Manzu	+	2.85 c
Bazzu	+	2.78 cd
XBE7110	+	2.77 cd
Grenade	+	2.64 d
Redval	+	2.38 e

[z] = Based on visual estimation of disease symptoms, on a scale of 0 to 5
[y] = Rhizomania-susceptible
[x] = Rhizomania-resistant
[w] = Column means with a letter in common are not statistically different (LSD t-test; *P*=0.05)