BEET (*Beta vulgaris*)
Verticillium wilt; *Verticillium dahliae*

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Verticillium wilt in transgenic sugar beet cultivars in Cassia County, ID, 2006.

Transgenic (resistant to glyphosate) sugar beet cultivars were evaluated in a commercial sprinkler-irrigated sugar beet field near Heyburn, ID where winter wheat was grown in 2005. The field trial relied on natural infection of *Verticillium dahliae*. The plots were planted on 28 Apr to a density of 142,560 seeds/A, and thinned to 47,520 plants/A on 15-20 Jun. Plots were four rows wide (22-in. row spacing) and 34.5 ft long. The experimental design was a randomized complete block design with eight replications per cultivar. The field was cultivated on 8 and 20 Jun. The crop was managed by the grower according to standard cultural practices except for herbicide applications. Transgenic cultivars were sprayed with broadcast applications of glyphosate at 32 fl oz/A on 30 May and 22 fl oz/A on 27 Jun. The study area was also hand weeded to keep all plots free of weeds. The percentage of plants with leaves that had dead vein delimited sectors was recorded for the center two rows on 6 Sep. The center two rows were harvested on 25-26 Sep with the aid of a mechanical topper and small plot harvester. The sugar content of the beets was determined by the Amalgamated Sugar Co. laboratory, and recoverable sugar was estimated. Data were analyzed using the general linear models procedure (Proc GLM-SAS), and Fisher's protected least significant difference was used for mean comparisons.

Yields from this field were below normal for this growing region. *Verticillium dahliae* symptoms and yield parameters varied significantly between cultivars. Root shape and root hair proliferation indicated that *Beet necrotic yellow vein virus* (BNYVV) also was present in the field although the foliar symptoms of this disease were not particularly evident. An interaction between BNYVV and *V. dahliae* may have been present in this field. Based on Spearman's rank correlation coefficient, the mean values for leaf symptoms were inversely related with those for root yield ($r = -0.3667$, $P = 0.0504$) but not sugar content or estimated recoverable sugar ($P = 0.1277$ and 0.2182, respectively). Good resistance to *V. dahliae* exists in some transgenic cultivars based on the reduction in foliar symptoms. Numerous transgenic cultivars with resistance to both *V. dahliae* and BNYVV had better yield parameters than the commercial check cultivars indicating growers should be able to switch to some of the resistant transgenic cultivars without experiencing yield loss.

Transgenic sugar beet cultivars [z]	Symptomatic plants (%)[y]	Root yield (t/A)	Sugar content (%)	Est. recoverable sugar (lb/A)
ACH Mustang	16.1 a	20.1 kl	14.06 ghi	4791.2 gh
Crystal 9689RR	15.1 ab	21.9 ijkl	14.51 cdefgh	5366.6 fgh
Beta B6218RR	13.4 abc	22.6 hijk	14.92 abcdef	6800.1 abcd
HH Acclaim R	13.3 abc	21.4 jkl	12.91 j	4518.3 hi
Beta B6217RR	12.4 abc	25.8 abcdefg	14.70 abcdefg	6461.3 bcde
HM Owyhee	12.0 abcd	15.3 m	13.82 hi	3612.4 i
Beta 4490R	11.7 abcd	20.7 kl	14.27 fgh	5027.2 gh
Beta B6214RR	11.0 abcde	26.4 abcdef	14.34 fgh	6473.6 abcde
Crystal 9684RR	10.9 abcde	26.7 abcde	14.30 fgh	6440.9 bcde
Crystal 217R	9.3 bcdef	22.6 hijk	13.81 hi	5283.1 fgh
Beta B6211RR	8.6 cdefg	27.6 ab	14.94 abcdef	6973.5 abcd
HM 9008RR	8.5 cdefgh	24.8 bcdefghi	14.95 abcdef	6369.6 bcde
Beta B6215RR	8.4 cdefgh	27.2 abc	15.40 ab	7265.5 abc
Beta G0505RR	6.0 defghi	23.8 efghij	15.28 abc	6159.2 def
Beta 6212RR	6.0 defghi	26.3 abcdef	15.27 abcd	6790.0 abcd
Beta G0507RR	5.9 defghi	26.1 abcdef	14.78 abcdefg	6574.8 abcd
Crystal 9688RR	5.9 defghi	22.6 hijk	13.37 ij	4994.4 gh
HM 9007RR	5.2 efghi	24.5 cdefghi	14.45 defgh	6010.5 def
Crystal 9687RR	3.5 fghi	25.2 abcdefgh	14.16 fghi	6123.0 def
HM 2992 RZ	3.3 fghi	19.5 l	14.39 efgh	4762.6 gh
Beta G0506RR	3.2 fghi	22.0 ijkl	14.03 ghi	5336.0 fgh
Crystal 9686RR	3.0 ghi	23.7 fghij	15.32 abc	6188.3 def
HM 9005RR	2.3 hi	27.9 a	15.56 a	7450.8 a
HM 9006RR	2.3 hi	25.2 abcdefgh	14.74 abcdefg	6349.1 cde
B05G26001RR	2.1 i	22.9 ghijk	14.14 fghi	5585.2 efg
Crystal 9685RR	1.8 i	24.4 cdefghi	14.81 abcdefg	6224.6 def
Beta B6213RR	1.6 i	26.8 abcd	14.59 bcdefgh	6661.4 abcd
HM 9009RR	1.3 i	28.1 a	15.19 abcde	7342.4 ab
Beta B6216RR	1.0 i	24.1 defghij	14.56 cdefgh	6008.6 def
$P > F$	<0.0001	<0.0001	<0.0001	<0.0001
LSD ($P \leq 0.05$)	6.3	2.9	0.82	977.8

[z] Commercial check cultivars included in the study were ACH Mustang, HH Acclaim R, HM Owyhee, Beta 4490R, Crystal 217R, and HM 2992 RZ. Cultivars with at least one R or RZ after the name are considered resistant to *Beet necrotic yellow vein virus* (normally inherited) but cultivars with RR after the name are transgenic and therefore also resistant to glyphosate.

[y] Symptomatic = Verticillium wilt symptoms. $P > F$ 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 value with $P \leq 0.05$.