TSERING, YOUDON[1], GARY D. FRANC[2], ANDREW R. KNISS[3] and WILLIAM L. STUMP[4], [1]Graduate student, [2]Professor, [3]Assistant Professor, [4]Research Scientist, University of Wyoming, Plant Sciences - 3354, Laramie, WY 82071. **Effects of herbicides and sugarbeet cultivars on Rhizoctonia root and crown rot development.**

ABSTRACT

Glyphosate-resistant sugarbeet cultivars are widely planted in the United States due to the ease of weed management. However, a greenhouse study suggested that host plant resistance to *Rhizoctonia* root and crown rot (RRCR) was compromised in glyphosate-resistant sugarbeet following glyphosate application (Larson et al., 2006). The objective of the research reported herein was to determine the effects of glyphosate [Roundup WeatherMax], or a conventional herbicide mix of Betamix, Upbeet, and Stinger, on RRCR disease development in glyphosate-resistant sugarbeet cultivars.

The greenhouse experiment was a factorial treatment arrangement set in a randomized complete block with twelve replicates. Factors consisted of four glyphosate-resistant sugarbeet cultivars, three herbicide treatments (including a "no herbicide applied" treatment), and the presence or absence of inoculation by *Rhizoctonia solani* isolate R1 (AG-2-2). The Roundup Ready sugarbeet cultivars tested were Beta 66RR70, Beta 66RR60, Hilleshog 9027 and Hilleshog 9032. These cultivars were selected to include a range of host-plant susceptibility to *R. solani* infection. Cultivars were exposed to three treatments; no herbicide (deionized water), Roundup WeatherMax and the conventional herbicide mix of Betamix + Upbeet + Stinger. Each cultivar x treatment combination was inoculated with *R. solani*. Non-inoculated cultivar x treatment combinations was used for comparison of treatment effects in the absence of disease. For the duration of the study, plants were watered daily and fertilized weekly.

Herbicide treatments were applied to sugarbeet plants within a spray chamber (Research Track Sprayer; DeVries, Hollandale, MN) at recommended field rates based on the surface area of the pot. Inoculation was carried out within 30 minutes after herbicide application by placing approximately 1 gram of *R. solani* inoculum (infested ground barley seed) to the crown of each plant. Sterile ground barley was added to the non-inoculated plants in a similar manner. Pots were then topped with soil to keep inoculum in place. Inoculation and herbicide treatments were done when sugarbeet plants were at the 6-8 true-leaf stage.

Eleven days after inoculation, foliar disease severity was estimated with Horsfall and Barrett's rating scale (Horsfall & Barratt, 1945). The disease grading scale ranged from 0-11 where 0 represents healthy sugarbeets while 11 represent dead sugarbeets. Foliar disease severity was rated every week for 4 weeks and an overall disease severity calculated by an area under the disease progress curve (AUDPC). Plants were harvested 49 days after inoculation and root rot severity was measured at harvest. Roots were washed under the tap and rated using the same disease grading scale from 0-11 where 0 represents no visible lesions while 11 represented 100 percent decay.

Results indicated that *R. solani* inoculation resulted in disease development as no disease developed in non-inoculated sugarbeets. The main effects of inoculation and cultivar as well as the interaction between inoculation and cultivar were significant; RRCR disease severity differed significantly among all sugarbeet cultivars ($P \leq 0.05$). The order of decreasing RRCR severity (increasing disease tolerance) was Beta 66RR60 (AUDPC=80.99, Root rot=10.1), Hilleshog 9032 (AUDPC=62.29, Root rot=9.3), Beta 66RR70 (AUDPC=49.96, Root rot=8.3), followed by

Hilleshog 9027 (AUDPC=30.22, Root rot=4.6). The interaction between herbicide treatment and inoculation was also significant ($P \leq 0.05$). Both herbicide treatments significantly increased RRCR disease severity compared to when no herbicide was applied ($P \leq 0.05$). RRCR disease severity was significantly increased following conventional herbicide (AUDPC=70.04, root rot=9.2) compared to the glyphosate treatment (AUDPC=54.59, root rot=8) ($P \leq 0.05$). Therefore, results reveal that either herbicide application to glyphosate-tolerant sugarbeet affected RRCR development and increased disease severity under greenhouse conditions.

Literature cited:

Larson, R. L., A. L. Hill., A. Fenwick, A. R. Kniss, L. E. Hanson, and S. D. Miller. 2006. Influence of glyphosate on *Rhizoctonia* and *Fusarium* root rot in sugar beet. Pest Management Science. 62:1182-1192.

Horsfall, J. G., and R. W. Barratt. 1945. An improved grading system for measuring plant disease. Phytopathology. (Abstract). 35: 655.