RHIZOCTONIA AND BACTERIAL ROOT ROT IN SUGARBEET

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The Amalgamated Sugar Company production area in southern Idaho and southeastern Oregon suffers considerable losses from root rot in the field. Both Rhizoctonia and bacterial root rots on sugarbeet are common in Treasure Valley and Magic Valley (Fig. 1 and 2), while eastern Idaho fields seem to be relatively root rot free. The yield losses in some Treasure Valley fields can approach or surpass 50%. The growers not only suffer losses in the field, but diseased roots also store and process poorly, leading to additional losses.

Figure 1. Rhizoctonia and bacterial root rot on sugarbeet in a Weiser, ID field during the 2009 growing season.

Figure 2. The sugarbeet top (left) and root (right) from the same plant. The sugarbeet leaves may only be stunted, but the root may be suffering from considerable bacterial root rot. Although bacterial root rot is very evident, fungal rot caused by *Rhizoctonia solani* likely helped to get the bacteria established in the root.

Rhizoctonia root rot caused by ***Rhizoctonia solani*** on sugarbeet results from initial infection propagules (sclerotia or mycelia), which are often associated with plant debris and able to survive in the soil for many years. The fungus becomes active when soil temperatures warm up and prefers temperatures of 77 to 82°F. However, not all ***R. solani*** strains are the same. This fungus comprises a species complex which is further subdivided into genetically distinct subgroups known as anastomosis groups (AG). In Idaho, the primary ***R. solani*** AG groups identified in sugarbeet were AG-2-2 IIIB and AG-4. Of all isolates collected from mature roots throughout the production area, 47% were AG-2-2 IIIB and 44% were AG-4. Eighty seven percent of the AG-2-2 IIIB isolates were discovered in the western half of the production area, while 61% of the AG-4 isolates were discovered in the eastern half. Both AG-2-2 IIIB and AG-4 can reduce sugarbeet stands, but AG-2-2 IIIB is primarily responsible for damage on older roots (Fig. 3), while AG-4 only causes superficial lesions on older roots. Managing these two subgroups through crop rotation is problematic because of their wide host range. AG-2-2 IIIB strains can cause damage to sugarbeet,

Figure 3. Rhizoctonia root rot on the outside (left) of the root. The same root was cut in half to show the extent of the black dry rot internally (right) that is typical of Rhizoctonia root rot.

Figure 4. The wet appearance, cavities, slime, and fermented root tissue associated with bacterial root rot in sugarbeet.

beans, corn, peas, and alfalfa along with some other crops not found in our production area. AG-4 strains can cause damage to sugarbeet, potatoes, peas, and alfalfa. Thus, the best rotation crops for limiting the build-up of inoculum in fields are barley and wheat. Using resistant cultivars would be a good management option, but only one cultivar has been approved for commercial production. We are conducting research into what resistance will work best in Idaho and what will be the best approach to approve cultivars for Idaho. Traditionally Rhizoctonia resistant cultivars have been approved through trials conducted in Ft. Collins, CO. Recent data suggests that production conditions in Idaho may require local screening.

The rot caused by ***R. solani*** in Idaho typically results in about 5% of the root mass becoming infected. However, this fungus appears to allow a number of other organisms to gain entry to the root. A particularly troublesome organism that ***R. solani*** helps establish in the root is a bacterium known as ***Leuconostoc mesenteroides*** subsp. ***dextranicum***. The bacterial root rot (Fig. 2 and 4) caused by this organism leads to considerably more infested root mass than ***R. solani***. On average, about 70% of the root mass is lost to bacterial root rot, while the fungi cause only 5% loss. The bacterial root rot leads to a vinegar-like fermented smell, rotted cavities, and wet viscous slime (Fig. 4), as opposed to the dry black rot associated with Rhizoctonia root rot (Fig. 3). Our research suggests that considerable resistance to the bacterial root rot exists in commercial and experimental cultivars. Within one or two years we should have data for the seed committee which will address resistance to both ***R. solani*** and ***L. mesenteroides***. Currently your best management options include rotating sugarbeet fields with wheat or barley, **not over irrigating**, not cultivating to keep from injuring roots and throwing soil into the crown, maintaining good plant spacing, and banding on a fungicide such as Quadris before the eight-leaf growth stage. Once approved, root rot resistant cultivars identified using host resistance will be one of your best management options.