

WINDELS, CAROL E.* and JASON R. BRANTNER, University of Minnesota, Northwest Research and Outreach Center, 2900 University Avenue, Crookston, MN 56716. **Intraspecific group of *Rhizoctonia solani* AG 2-2 and rotation with corn affect sugar beet.**

ABSTRACT

Rhizoctonia solani AG 2-2, cause of Rhizoctonia crown and root rot (RCRR) of sugar beet, is further classified to the intraspecific groups (ISGs) IV and IIIB. Typically, *R. solani* AG 2-2 IIIB is more aggressive than 2-2 IV in causing disease on sugar beet and bean crops. The pathogen is increasing in prevalence on sugar beet in the Red River Valley (RRV) of Minnesota and North Dakota and is attributed in part, to close rotation of susceptible crops (e.g., soybean, edible beans), planting of susceptible sugar beet cultivars, and weather favorable for infection. Thus, rotation of non-host crops (spring wheat and corn) has been recommended to prevent build-up, or to reduce high population densities, of *R. solani* AG 2-2. Crop rotations are changing in the RRV. From 1995 to 2007, acres of spring wheat sown decreased from 3,045,200 to 2,032,000 (33%); soybean increased from 823,000 to 1,983,200 (141%); and corn increased from 398,000 to 1,149,200 (189%).

Our objectives were to conduct field trials to determine 1.) pathogenicity and survival of *R. solani* AG 2-2 IV and AG 2-2 IIIB on rotation crops (corn, spring wheat, soybean) and 2.) pathogenicity on a following sugar beet crop.

In May of 2005 and 2006, plots were not inoculated (control) or inoculated with *R. solani* AG 2-2 IV or AG 2-2 IIIB by sprinkling infested barley grain (equivalent of 35 kg per hectare) on the soil surface and incorporating with a Melroe multi-weeder. Within 24 hr, each main plot was sown with spring wheat, soybean, and corn (split-plots, four replications in a randomized block design). Disease was assessed on subcrown internodes of spring wheat, basal stems of soybean, and roots of corn (25 plants per replicate of each crop); subsamples then were excised for isolation of *R. solani*. Crops were harvested when mature. Sugar beet was sown the following growing season (2006 and 2007). Data were collected on emergence and at harvest, for RCRR (0-7 scale, 0 = root healthy, 7 = root completely rotted and foliage dead), yield and quality.

No above-ground symptoms of Rhizoctonia diseases were observed on rotation crops in inoculated or control plots throughout the growing season in 2005 or 2006. Root rot was not observed on spring wheat or soybean. Root rot, however, was observed on corn – and the author's believe this is the first report of *R. solani* AG 2-2 IIIB causing disease on corn in the Upper Midwest. Isolation of *R. solani* from roots of rotation crops was very similar in both years. Average isolation from spring wheat, soybean, and corn in the control was 1, 2, and 5%, respectively; in 2-2 IV plots was 4, 12, and 16%, respectively; and in 2-2 IIIB plots was 2, 5, and 33%, respectively. There were no differences in yields in inoculated and control plots of any rotation crop in either year.

Rhizoctonia damping-off on sugar beet was more active in 2006 than in 2007 because of more favorable temperatures within the first month after planting in 2006, but the same trends occurred in both years. Damping-off started to occur about 3 weeks after planting. Stands were highest in control plots regardless of previous crop and were significantly ($P = 0.05$) lower in plots previously inoculated with *R. solani* AG 2-2 IIIB and sown with corn or soybean. Stands were intermediate and equal in plots inoculated with *R. solani* AG 2-2 IV following all crops and in plots inoculated with *R. solani* AG 2-2 IIIB and sown with spring wheat.

By harvest, RCRR was more severe in 2006 than in 2007. In both years, RCRR was significantly ($P = 0.05$) higher in plots inoculated with *R. solani* AG 2-2 IIIB, lowest in the control, and intermediate in plots inoculated with *R. solani* AG 2-2 IV. Ratings for RCRR were highest after corn, lowest after wheat, and intermediate after soybean. In 2006, sugar beet root and sucrose yields (averaged across all plots) were significantly ($P = 0.05$) higher following spring wheat and equally lower following soybean and corn. In 2007, sugar beet yields tended to be highest after spring wheat and soybean and lower after corn.

In conclusion, Rhizoctonia diseases of sugar beet were significantly more severe when soil was infested with *R. solani* AG 2-2 IIIB than with AG 2-2 IV. Spring wheat was the best crop to grow before sugar beet, regardless of *R. solani* AG 2-2 ISGs present. When RCRR was severe on sugar beet, however, a previous crop of spring wheat was inadequate to reduce disease to a reasonable level. Soybean production increased inoculum of both AG 2-2 IV and AG 2-2 IIIB and this crop should be avoided the year before sugar beet. Corn grown in plots infested with *R. solani* AG 2-2 IIIB increased inoculum of the pathogen. Thus, corn is a potential host of *R. solani* AG 2-2 IIIB and should not be grown the year before sugar beet when this ISG is present in a field.