CHANDA, ASHOK K.* and JASON R. BRANTNER, Department of Plant Pathology, University of Minnesota, Northwest Research and Outreach Center, Crookston, MN 56716. **Integrated management of Rhizoctonia on sugar beet: resistant varieties, at-planting and postemergence fungicides**

ABSTRACT

Rhizoctonia damping-off and crown and root rot (RCRR) caused by *Rhizoctonia solani* AG 2-2 have been the most common root diseases on sugar beet in Minnesota and North Dakota for several years. Disease can occur throughout the growing season and reduces plant stand, root yield, and quality. Warm and wet soil conditions favor infection. Disease management options include rotating with non-host crops (cereals), planting partially resistant varieties, planting early when soil temperatures are cool, improving soil drainage, and applying fungicides as seed treatments, in-furrow (IF), or after emergence.

In 2015, a field trial was established to evaluate an integrated management strategy consisting of a resistant, moderately resistant and a susceptible variety with seed treatments (penthiopyrad and sedaxane) or in-furrow azoxystrobin alone and in combination with a postemergence azoxystrobin band application for 1) control of early-season damping-off and RCRR and 2) effect on yield and quality of sugar beet. Prior to planting, soil was infested with *R. solani* AG 2-2-infested whole barley (35 kg ha^{-1}). The trial was sown in six-row plots (22-inch row spacing, 30-ft rows) on May 08 at 4.5-inch seed spacing utilizing randomized complete block design. By 5 weeks after planting, plant stands were highest for the resistant variety, followed by the moderately resistant, and lowest for the susceptible variety. In all varieties, seed treated with penthiopyrad or sedaxane, or in-furrow azoxystrobin resulted in higher emergence and stand establishment over 9 weeks than the untreated control. There were significant (P = 0.05) variety by at-planting treatment interactions on yield and significant (P = 0.05) variety by at-planting by postemergence treatment interactions on root rot rating and recoverable sugar A^{-1} (RSA). Resistant and moderately resistant varieties had lower root rot ratings and higher number of harvested roots and RSA compared to the susceptible variety. Plots treated with azoxystrobin in-furrow had lower root rot ratings and higher number of harvested roots, yield, and recoverable sucrose than untreated controls, while plots with penthiopyrad or sedaxane seed treatments were not significantly different from untreated controls. There were no significant differences between untreated control and postemergence azoxystrobin application on any harvest parameters because of dry growing conditions during later part of the growing season in 2015.

In 2016, a field trial was established to evaluate an integrated management strategy consisting of a resistant and moderately susceptible variety with seed treatments (penthiopyrad, sedaxane, and fluxapyroxad) in combination with a postemergence azoxystrobin band application at the 4- or 8-leaf stage for 1) control of early-season damping-off and RCRR and 2) effect on yield and quality of sugar beet. Prior to planting, soil was infested with *R. solani* AG 2-2-infested whole barley (35 kg ha^{-1}). The trial was sown in six-row plots (22-inch row spacing, 30-ft rows) on May 03 at 4.5-

inch seed spacing. Plots were set up in a split-split plot design. Main plots were varieties, the first split was seed treatments, and the last split was postemergence azoxystrobin timings. Each variety by seed treatment combination was planted in triplicate, so that at the 4- or 8-leaf stage, one plot of each variety by seed treatment combination received a postemergence 7-inch band application of azoxystrobin (14.3 fl oz product A^{-1}) while one was left as a stand-alone treatment. There were no significant ($P = 0.05$) two way or three way interactions for stand or harvest data. Resistant and moderately susceptible varieties had similar stands until 3 weeks after planting (WAP), and from 4 to 7 weeks resistant variety had higher stands compared to moderately susceptible variety and by 8 weeks both varieties had similar stands. At-planting (seed) treatments and untreated control had similar stands until 4 WAP and all the three seed treatments had higher stands compared to untreated control from 5 to 8 WAP. Moderately susceptible variety had higher yield and also higher sugar loss to molasses (SLM) compared to the resistant variety. Root rot rating, yield, and other harvest parameters were not significantly different for the seed treatments and untreated control. Root rot severity and percent incidence (percent of roots with a disease rating of > 2.0) was significantly higher in the treatments without postemergence azoxystrobin application, intermediate in 4-leaf azoxystrobin, and lowest in the 8-leaf azoxystrobin application. Yield and recoverable sugar A^{-1} (RSA) was higher for 8-leaf azoxystrobin application compared to no azoxystrobin because of favorable conditions for development of disease later in the season in 2016.

Overall, seed treatments protected early-season stand, but did not result in increased yield, while postemergence azoxystrobin increased yield when conditions later in the season were favorable for disease, but not when conditions were dry. Varieties with at least a moderate level of resistance outperformed the susceptible variety.