COMPARING SEED TREATMENTS FOR CONTROL OF RHIZOCTONIA SOLANI

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Rhizoctonia root and crown rot, caused by *Rhizoctonia solani* Kühn, is currently the most devastating soil borne disease of sugarbeet (*Beta vulgaris* L.) in North Dakota and Minnesota. In the bi-state area, *R. solani* anastomosis group (AG) 1, AG-2-2, AG-4 and AG-5 cause damping off and AG-2-2 causes root and crown rot of sugarbeet (Windels and Nabben 1989). *R. solani* survives as thickened hyphae and sclerotia in organic material and is endemic in soils where sugarbeet is grown. *R. solani* has a wide host range including broad leaf crops and weeds (Anderson 1982; Nelson et al. 2002). Crop rotations of three or more years with small grains planted before sugarbeet is recommended to reduce disease incidence (Windels and Lamey 1998). In fields with a history of high disease severity, growers may plant varieties that are more resistant but with significantly lower yield potential compered to more susceptible varieties (Panella and Ruppel 1996). Research showed that timely application of azoxystrobin provided effective disease control but not when applied after infection or after symptoms were observed (Brantner and Windels, 2002; Jacobsen et al. 2002). Fungicidal seed treatments were developed and commercialized starting in 2013 to provide early season protection from *R. solani*.

The objective of this research was to evaluate the fungicidal seed treatments with and without a post-application fungicide their effectiveness at controlling *R. solani* and impact on yield and quality in sugarbeet.

MATERIALS AND METHODS

A field trial was conducted at Hickson, ND in 2016. The site was inoculated on 2 May with *R. solani* AG 2-2 IIIB grown on barley. Inoculum was broadcast using a three-point mounted rotary/spinner type spreader calibrated to deliver 35 lbs/A of inoculum. The inoculum was incorporated with a Konskilde field cultivator to about the two-inch depth before planting. The experimental design was a randomized complete block with four replicates. Field plots comprised of six 25-foot long rows spaced 22 inches apart. Plots were planted to stand on 5 May with Crystal 101RR. Seeds were treated with Tachigaren at 45 g/kg seed to provide early season protection against *Aphanomyces cochlioides*, and Poncho Beta. Counter 20G was also applied at 9 lb/A at planting to control insect pests. Weeds were controlled on 9 June, 7 and 25 July. Fungicides were sprayed to control Cercorpora leaf spot on 25 July, 12 and 24 August.

The fungicides and rates used are listed in Table 1. Different commercial seed treatments were used alone and with a post fungicide applied in a 7-inch band application. The band-applications were made on 2 June at the four leaf stage using 17 gal of spray solution/A.

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 26 September and weights were recorded. Samples (12-15 roots) from each plot, not including roots on the ends of plots, were analyzed for quality at American Crystal Sugar Company tare laboratory at East Grand Forks, MN. The data analysis was performed with the ANOVA procedure of the Agriculture Research Manager, version 8 software package (Gylling Data Management Inc., Brookings, South Dakota, 2010). The least significant difference (LSD) test was used to compare treatments when the F-test for treatments was significant.

RESULTS AND DISCUSSIONS

The first significant rainfall was 20 days after planting on May 25 and again on May 30. Plant stand was very variable in all treatments and counts taken on June 7 indicated variable stands but no significant differences among treatments. Dry conditions continued in June resulting in no observation of seedling damping-off. Rainfall on July 11 (2.84'') and 19 (0.52'') resulted in conditions more favorable for infection by *R. solani*. Typical symptoms of Rhizoctonia root rot including leaf wilting, yellowing, and death of leaves and entire plants were observed starting in August. At harvest, the untreated check had the lowest plant stand but was not significantly different from any of the fungicide treatments. However, all treatments which had a Quadris post-application resulted in higher stand and higher tonnage compared with the same treatment without Quadris. The Vibrance and Metlock+Rizolex+Kabina

seed treatments which received a Quadris post-application resulted in significantly higher sucrose concentration compared to the seed treatments used alone. The Vibrance and Metlock+Rizolex+Kabina seed treatments which received a Quadris post-application also resulted in significantly higher recoverable sucrose compared to the seed treatments used alone. Likewise, the treatment with no fungicide seed treatment for *R. solani* control but which received a post application of Quadris resulted in significantly higher recoverable sucrose compared to the non-treated check.

In the non-diseased conditions which prevailed early in the growing season, there were no significant differences in plant stand among seed treatments. At harvest, plant stand, although not statistically significantly, were lower in treatments which had fungicides only the seeds compared to treatments which combined fungicides on seeds with a post application. Post application of Quadris protected plants from the later season Rhizoctonia root rot. This research indicated the need and usefulness of having a timely application of Quadris to help provide season long protection from *R. solani*.

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Table 1. Effect of seed treatments and on Rhizoctonia root rot at Hickson, ND in 2016

Product and Rate in fl oz/A	7 June Stand Cound	22 June Stand Count	26 September Stand Count	26 September Yield	26 September Sucrose concentration	26 September Recoverable sucrose
	beets/100'	beets/100'	beets/100'	Ton/A	%	lb/A
Untreated	158	164	142	28.7	15.0	7,488
Kabina 14g	160	163	156	30.5	15.5	8,364
Vibrance	189	193	158	28.6	14.5	7,310
Metlock + Rizolex + Kabina 7g	162	174	147	28.0	14.5	7,200
Untreated **fb** Quadris 9.2 fl oz*	183	186	188	37.2	15.4	10,185
Kabina 14g **fb** Quadris 9.2 fl oz*	162	170	166	32.3	15.3	8,689
Vibrance **fb** Quadris 9.2 fl oz*	175	176	171	32.5	15.7	9,129
Metlock + Rizolex + Kabina 7g **fb** Quadris 9.2 fl oz*	159	176	175	34.0	15.3	9,212
LSD (P=0.10)	**NS**	**NS**	**NS**	**NS**	**0.66**	**1,626**

*Treatment applied POST on 2 June.