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 2017. The site was inoculated on 28 April 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 58 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 3 May with a susceptible and tolerant variety. 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 1 and 13 June 10 July. Fungicides were sprayed to control Cercorpora leaf spot on 24 July 2 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 12 June at the eight 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 11 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*.

References

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Table 1. Effect of seed treatments and on Rhizoctonia root rot at Hickson, ND in 2017

Product and Rate in fl oz/A	19 June Stand Cound	9 August Stand Count	11 September Stand Count	11 September Yield	11 September Sucrose concentration	11 September Recoverable sucrose
	beets/100'	**beets/100'**	**beets/100'**	**Ton/A**	**%**	**lb/A**
Untreated	207	188	144	30.7	17.7	9,799
Kabina 14g	207	193	149	32.3	17.2	9,832
Vibrance	214	199	148	32.0	17.5	10,041
Metlock + Rizolex + Kabina 7g	207	199	149	32.5	17.0	9,809
Systiva	220	213	163	36.7	17.5	11,518
Untreated **fb** Quadris 9.2 fl oz*	193	204	162	35.7	17.8	11,426
Kabina 14g **fb** Quadris 9.2 fl oz*	202	211	167	32.1	17.7	10,223
Vibrance **fb** Quadris 9.2 fl oz*	209	205	164	32.3	17.7	10,332
Metlock + Rizolex + Kabina 7g **fb** Quadris 9.2 fl oz*	215	229	171	34.9	17.4	10,922
Systiva **fb** Quadris 9.2 fl oz*	211	225	163	35.6	17.7	11,429
Untreated**	197	194	163	34.9	18.3	11,825
Kabina 14g**	224	206	168	31.7	18.9	11,117
Vibrance**	210	201	166	30.4	18.6	10,483
Metlock + Rizolex + Kabina 7g**	213	197	163	31.3	18.7	10,851
Systiva**	216	203	164	29.7	19.0	10,533
Untreated** **fb** Quadris 9.2 fl oz*	208	214	166	35.2	18.7	12,165
Kabina 14g** **fb** Quadris 9.2 fl oz*	217	214	168	32.2	18.6	11,065
Vibrance** **fb** Quadris 9.2 fl oz*	216	215	168	32.4	19.1	11,422
Metlock + Rizolex + Kabina 7g** **fb** Quadris 9.2 fl oz*	216	219	174	34.9	18.7	12,156
Systiva** **fb** Quadris 9.2 fl oz*	216	215	169	33.0	18.8	11,476
LSD (P=0.10)	**13**	**NS**	**NS**	**3.59**	**0.68**	**1,095.7**

*Treatment applied POST on 2 June.
**Tolerant variety used instead of Susceptible variety