SAFETY AND EFFICACY OF STARTER FERTILIZERS, CHEMICAL SEED TREATMENTS AND FUNGICIDES AGAINST RHIZOCTONIA SOLANI ON SUGARBEET

Mohamed F. R. Khan[1] and Peter C. Hakk[2]

[1]Extension Sugarbeet Specialist, North Dakota State University & University of Minnesota
[2]Research Technician, Plant Pathology Department, North Dakota State University

Rhizoctonia root and crown rot, caused by *Rhizoctonia solani* Kühn, is currently the most devastating soilborne 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* has a wide host range including broad leaf crops and weeds (Anderson 1982). Severe disease occurs if sugarbeet follows beans or potato in a rotation (Baba and Abe 1966; Johnson et al. 2002). In fields with a history of high disease severity, growers may plant varieties that are more resistant but with significantly lower yield potential compared to more susceptible varieties (Panella and Ruppel 1996). All varieties, including Rhizoctonia resistant varieties, are susceptible to the pathogen in early growth stages.

The objective of this research was to determine the safety of different seed treatments and their efficacy at controlling Rhizoctonia damping off and root rot in sugarbeet.

MATERIALS AND METHODS

A field trial was conducted in Hickson, ND in 2014. The site was inoculated on 24 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 18 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 27 May with various seed treatments. Counter 20G was also applied at 9 lb/A at planting to control insect pests. Weeds were controlled on 13 June, 25 June and 16 July.

Treatments were applied either as seed treatments, in-furrow application, in-furrow application followed by one POST application; and a POST application at the two leaf stage. The in-furrow application was made on 27 May (at planting) with a spray volume of 7.1 gal/A. The POST application was made on 4 June. The POST application was made using a bike sprayer with flat fan nozzles (4002E) spaced 22’’ apart, set 9.5 inches above the soil, and calibrated to deliver 17 gal solution/A at 40 p.s.i pressure to the middle four rows of plots in a 7” band centered over each row. Quadris was used at 9.2 fl oz/A while 6-24-6 and 10-34-0 was used at 3 gallon/A.

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 8 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

Warm and wet soils resulted in favorable conditions for infection by *R. solani* soon after emergence. Seedlings with damping-off symptoms were confirmed in the laboratory with both *R. solani* and *Aphanomyces cochlioides* present. Wilting, yellowing of leaves of older plants and plant death started in July and continued throughout the season.

Treatments where seeds were not treated with Kabina or Tachigaren and did not have Quadris applied in-furrow had significant reduction in stand starting early in the season. However, at the end of the rather poor growing season, there were no significant differences in yield or recoverable sucrose between treatments that had lower plant stand early in the season compared to those with significantly higher plant stand.

The use of Kabina seed treatment performed similarly to Quadris applied in-furrow. The results indicated that the post application of Quadris did not help disease control if there was no Kabina or Tachigaren at planting. This was probably because the POST application of Quadris was made after the fungus had already become active and infective since favorable environmental conditions (65°F soil at 4" depth with adequate moisture) had started since at planting and continued through to harvest. The use of starter fertilizers did not adversely impact plant stand. However, the use of starter fertilizers did not result in an increase in yield or recoverable sucrose.

References

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Table 1. Effect of seed treatments, starter fertilizers and fungicides at controlling *R. solani* on sugarbeet at Hickson, ND in 2014.

		24 June	**16 July**	**8 September**			
Product and Rate in fl oz/A	**Application Date(s)**	**Stand Count**	**Stand Count**	**Stand Count**	**Yield**	**Sucrose concentration**	**Recoverable sucrose**
		beets/100'	**beets/100'**	**beets/100'**	**Ton/A**	**%**	**lb/A**
TMTD + Apron **fb** Quadris 9.2 fl oz	Seed Trt fb 4 June	198	190	146	19.5	13.4	4,358
TMTD + Apron + Tach 45 + Poncho Beta + Kabina 14 **fb** Quadris 9.2 fl oz	Seed Trt **fb** 4 June	237	222	197	21.3	12.9	4,850
TMTD + Apron + Tach 45 **fb** Quadris 9.2 fl oz **fb** Quadris 9.2 fl oz	Seed Trt **fb** 27 May **fb** 4 June	233	222	167	19.8	13.0	4,511
TMTD + Apron + Tach 45	Seed Trt	220	207	162	20.1	13.1	4,628
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 14	Seed Trt	232	219	186	21.5	13.3	5,153
Poncho Beta + TMTD + Apron + Tach 45 **fb** Quadris 9.2 fl oz	Seed Trt **fb** 27 May	231	219	161	18.7	13.2	4,373
TMTD + Apron + Tach 45 + Kabina 14 **fb** 6-24-6 3 gal	Seed Trt **fb** 27 May	234	222	166	19.5	13.1	4,502
TMTD + Apron + Tach 45 + Kabina 14 **fb** 10-34-0 3 gal	Seed Trt **fb** 27 May	231	216	156	20.7	13.2	4,776
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 14 **fb** 6-24-6 3 gal **fb** Quadris 9.2 fl oz	Seed Trt **fb** 27 May **fb** 4 June	232	223	161	19.1	12.9	4,329
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 7 **fb** 10-34-0 3 gal **fb** Quadris 9.2 fl oz	Seed Trt **fb** 27 May **fb** 4 June	226	210	163	20.6	12.9	4,683
LSD (P=0.05)		**18**	**16**	**18**	**NS**	**NS**	**NS**