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

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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; Nelson et al. 1996). 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

Field trial was conducted in Hickson, ND in 2013. The site was inoculated on 28 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 just 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 28 May with various seed treatments. Counter 20G was also applied at 9 lb/A at planting to control insect pests. Weeds were controlled with glyphosate on 25 June, 10 July, 19 July, 9 August and 22 August. Leaf spot was controlled with fungicide applications on 9 August and 22 August.

Treatments were applied either as in-furrow application; in-furrow application followed by one POST application; and a POST application at the four to six leaf stages. The in-furrow application was made on 28 May (at planting) with a spray volume of 9.5 gal/A. The POST application was made on 12 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 4 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

Planting was delayed by prolonged wet field conditions and planting was done when average daily soil temperature was 64 F. Rains immediately after planting delayed a band application designed to be applied at 65 F average soil temperature until 12 June, about one week after the soil temperature threshold was reached. Emergence was good but crop growth was very slow because of late fertilization also delayed by wet conditions. Stand count was taken regularly during the season with the first on 13 June. All treatments with Kabina had increased plant stand one week after the first count. Few treatments without Kabina had reduced stand one week after the first count, including one treatment where Quadris was used as a post application. There was a low level of disease incidence throughout the growing season. Most of the Kabina treatments had greater but not always significantly different plant stand than seed treatments without Kabina. No phytotoxicity was observed in any of the treatments which indicate it was safe to use Kabina with other seed treatments including the insecticide Poncho Beta and the fungicide Tachigaren. There was no stand reduction when starter fertilizers (6-24-6 or 10-34-0 at 3 GPA) were used at planting with any of the seed treatments with Kabina. Quadris applied on 12 June was not very effective at protecting plant stand, probably because it was applied after the 65 F average soil temperature was attained and there was already some initial infection. Quadris applied in-furrow at planting provided effective protection and resulted in a high plant stand but did not always translate into the highest recoverable sucrose. Tonnage and recoverable sucrose was relatively low at this location probably as a result of several factors including late planting and poor growing conditions. It was observed at several locations that treatments with low plant stand were able to compensate and still produce yields comparable to treatments with significantly higher plant stand. These results (and greenhouse data – unpublished) indicate that Kabina seed treatments followed by a timely application of Quadris should provide season long control of Rhizoctonia damping off and root rot while facilitating the use of other seed treatments and the practice of using starter fertilizers.

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 2013.

Product and Rate in fl oz/A	Application Date(s)	13 June Stand Count	1 July Stand Count	3 October Stand Count	3 October Yield	3 October Sucrose concentration	3 October Recoverable sucrose
		beets/100'	**beets/100'**	**beets/100'**	**Ton/A**	**%**	**lb/A**
TMTD + Apron + Tach 45	Seed Trt	140	131	102	14.8	15.7	4,310
TMTD + Apron **fb** Quadris 9.2	Seed trt **fb** 12 June	127	126	120	14.7	15.7	4,266
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 7 **fb** Quadris 9.2	Seed Trt **fb** 12 June	133	177	160	16.5	15.5	4,720
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 14 **fb** Quadris 9.2	Seed Trt **fb** 12 June	160	170	144	16.5	15.4	4,745
TMTD + Apron + Tach 45 **fb** Quadris 9.2 **fb** Quadris 9.2	Seed Trt **fb** 28 May **fb** 12 June	127	164	161	15.1	15.3	4,261
TMTD + Apron + Tach 45 + Kabina 7	Seed Trt	121	142	131	15.0	15.2	4,199
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 14	Seed Trt	155	172	140	15.7	15.4	4,481
Poncho Beta + TMTD + Apron + Tach 45 **fb** Quadris 9.2	Seed Trt **fb** 28 May	156	161	156	16.5	16.0	4,906
TMTD + Apron + Tach 45 + Kabina 7 fb 6-24-6 3 gal	Seed Trt fb 28 May	184	184	137	16.1	15.3	4,538
TMTD + Apron + Tach 45 + Kabina 14 **fb** 6-24-6 3 gal	Seed Trt **fb** 28 May	179	190	160	17.1	15.4	4,857
Poncho Beta +TMTD + Apron + Tach 45 + Kabina 14 **fb** 6-24-6 3 gal **fb** Quadris 9.2	Seed Trt **fb** 28 May fb 12 June	172	188	169	17.7	15.7	5,161
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 7 **fb** 10-34-0 3 gal **fb** Quadris 9.2	Seed Trt **fb** 28 May **fb** 12 June	160	170	141	16.5	15.5	4,726
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 14 **fb** 10-34-0 3 gal **fb** Quadris 9.2	Seed Trt **fb** 28 May **fb** 12 June	167	175	158	17.9	15.8	5,271
Poncho Beta + TMTD + Apron + Tach 45 + Kabina 14 **fb** 6-24-6 3 gal **fb** Quadris 9.2	Seed Trt **fb** 28 May **fb** 12 June	161	177	156	17.3	15.6	4,997
LSD (P=0.05)		**34.2**	**21.9**	**23.2**	**2.5**	**0.6**	**799.5**