DEVELOPING A STRIP TILLAGE SYSTEM FOR DELIVERING FUNGICIDE 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).

Growers in North Dakota, Minnesota and Michigan typically use conventional land preparation for sugarbeet production. The advent of Roundup Ready sugarbeet has facilitated production using no-till or strip-till (reduced tillage) especially in areas such as Nebraska, Colorado and Montana. The objective of this research was to evaluate the effect of strip tillage and fungicide treatments with and without a post-application fungicide and their effectiveness at controlling *R. solani* and impact on yield and quality in sugarbeet.

MATERIALS AND METHODS

A field trial was conducted at Moorhead, MN in 2018. The experimental design was a randomized complete block with four replicates. Field plots comprised of six 30-foot long rows spaced 22 inches apart. Plots were planted to stand on 23 May with a susceptible 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 7 and 25 June. Fungicides were sprayed to control Cercorpora leaf spot on 25 July, 8 and 20 August.

The fungicides and rates used are listed in Table 1 as well as strip tillage depth. The POST band-applications were made on 21 June at the four leaf stage using 17 gal of spray solution/A while the at-strip tillage application was made on 22 May using 16 gal of spray solution/A and the in-furrow application was made at planting on 23 May using 7.1 gal of spray solution/A

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 10 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

There were no significant differences in plant stand from the different treatments at different dates counts were taken. However, a plant stand target of 175 to 200 plants per 100 ft of row was not attained in all treatments, probably because of inadequate moisture after planting. There was no seedling damping-off or symptoms of Rhizoctonia root rot most probably because of relatively dry conditions for most of the season. The treatment where no fungicide was applied at planting had the highest plant stand, tonnage, and recoverable sucrose. Since conditions did not favor disease development, differences in tonnage and recoverable sucrose could not be attributed to differences in timing or depth of fungicide applications. It is possible that some of the placement of the fungicides or the soil disturbance at the different depths could have adversely impact plant stands. There were significant differences in tonnage, sugar loss to molasses and recoverable sucrose among treatments, but these could not be attributed to any specific treatment or agronomic practice.

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Table 1. Strip Tillage and Rhizoctonia Control- Moorhead, MN 2018

Treatment	Timing	Stand Count 6/12	Stand Count 6/28	Stand Count 7/10	Stand Count 9/10	Yield Ton/A	Sucrose %	SLM %	Sucrose lb/a
Untreated No Kabina	-	155	167	153	165	24.6	15.5	1.50	6,882
Quadris	B	162	172	159	154	25.8	15.3	1.59	7,038
4 Inch Injection Quadris	A	167	168	163	176	26.9	15.3	1.54	7,418
0 inch depth Quadris	A	157	175	162	161	24.8	15.8	1.46	7,138
2 inch depth Quadris	A	158	168	159	155	25.0	15.5	1.66	6,900
2 and 4 inch depth Quadris	A	156	174	149	157	23.9	15.4	1.62	6,589
2 and 0 inch depth Quadris	A	153	159	154	158	24.3	15.4	1.57	6,718
No Kabina Quadris	C	194	185	191	194	28.5	15.4	1.54	7,875
Quadris	BC	164	169	167	166	24.9	15.3	1.62	6,811
4 Inch Injection Quadris	AC	175	170	168	162	24.3	15.5	1.58	6,773
0 inch depth Quadris	AC	174	180	172	158	26.1	15.5	1.50	7,299
2 inch depth Quadris	AC	170	192	171	162	25.1	15.2	1.68	6,781
2 and 4 inch depth Quadris	AC	172	182	172	168	27.0	15.2	1.58	7,343
2 and 0 inch depth Quadris	AC	157	164	159	163	25.3	15.3	1.66	6,896
LSD P=0.10	-	NS	NS	NS	NS	1.85	NS	0.105	558.6

Stand Counts are #/100’ Row
Harvest occurred at time of last stand count; 10 September, 2018
Application A was injected during strip tillage on 22 May, 2018
Application B was applied In-Furrow during planting on 23 May, 2018
Application C was applied at the 4-6 leaf stage on 21 June, 2018