EFFECT OF FUNGICIDES AND STARTER FERTILIZER ON PHYTOTOXICITY AND CONTROLLING RHIZOCTONIA ROOT ROT IN 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 the 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. 1996). Severe disease occurs if sugarbeet follows beans or potato (Baba and Abe 1966; Johnson et al. 2002). Crop rotations of 3 or more years with small grains planted before sugarbeet is recommended to reduce disease incidence (Windels and Lamey 1998). However, the acreage of small grains has significantly decreased over the past decade. Research showed that timely application of Quadris and Proline provided effective disease control when applied before infection takes place (Khan and Carlson, 2010). Headline and Quadris fungicides applied in-furrow has also shown to provide effective early season disease control. Many growers typically use a liquid starter fertilizer applied in-furrow at planting. There are reports that the use of fungicides mixed with starter fertilizer result in phytotoxicity.

The objective of this research was to determine the safety and effectiveness of mixing starter fertilizer (10-34-0) with different fungicides for controlling Rhizoctonia root rot in sugarbeet.

MATERIALS AND METHODS

Field trial was conducted in Glyndon, MN in 2011. The site was inoculated on 18 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 15 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 18 May a commercially available, glyphosate tolerant variety (Proprietary material, Crystal Beet Seeds) which was resistant to Rhizomania and very susceptible to *Rhizoctonia solani*. Seeds were also treated with Tachigaren at 45 g/kg seed to provide early season protection against *Aphanomyces cochlioides*, and Poncho-Beta to provide protection against insect pests. Counter 15G was also applied at 11.9 lb/A at planting to control insect pests. Weeds were controlled with glyphosate on 20 June, 6 July and 11 August.

The fungicides and rates used are listed in Table 1. Treatments were applied as in-furrow applications on 18 May (at planting) using 23 gal of spray solution/A.

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 28 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 emergence of sugarbeet seedlings. Several treatments, including Picoxystrobin+10-34-0 and Headline+10-34-0 resulted in significantly lower plant stand than the inoculated check on 6 June. Stand counts taken 14 June showed that Picoxystrobin+10-34-0 appeared to slow emergence and cause stunting of seedlings.

Conditions starting early in the season, and continuing through the growing season, were favorable for infection by *R. solani.* Most treatments, except starter fertilizer by itself, starter fertilizer with Serenade (*Bacillus subtilis*), and starter fertilizer with Dynasty seed treatment resulted in significantly greater plant stands than the inoculated check at harvest. Although Headline and Picoxystrobin caused some reduction in plant stands early in the season, they provided good protection against *R. solani* for the plants that did emerge, and thus gave better plant stands at harvest than the inoculated check. Headline at 12 fl oz was generally more effective than at 6 fl oz. All the fungicides mixed with starter fertilizer, except Headline at 6 fl oz, Serenade, and Dynasty seed treatment resulted in significantly greater recoverable sucrose compared to the inoculated check.

All treatments, including those that had the greatest yields, had some stand loss during the season. It is possible that the addition of a POST applied fungicide could help to reduce stand loss later in the season and contribute to even greater yields.

Care should be taken when using fungicides with starter fertilizer at planting since some combinations may reduce plant stand. In this trial, treatments were applied immediately after mixing and application was made when the soil temperature at the four inch depth was 60°F. It is possible to have greater stand loss and/or phytotoxicity if the mixture is not properly agitated before application and is applied in cooler soils.

References

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Table 1. Effect of fungicides and 10-34-0 starter fertilizer applied in-furrow on sugarbeet stand, yield, and quality at Glyndon, MN in 2011.

Treatment	6 June Stand Count	14 June Stand Count	Plants/ 100 ft row	28 September Yield	Sucrose concentration	Recoverable sucrose
In-furrow rate/A	**beets/100’**	**beets/100’**	**beets/100’**	**Ton/A**	**%**	**lb/A**
Inoculated check	207	192	69	18.0	14.5	4215
10-34-0 3 gpa	196	188	73	16.4	14.8	4228
10-34-0 3 gpa + Quadris 14.3 fl oz	189	195	160	25.2	16.3	7367
10-34-0 3 gpa + Quadris 9.2 fl oz	200	205	163	27.2	15.8	7629
10-34-0 3 gpa + Headline 12 fl oz	178	182	118	22.0	15.8	6158
10-34-0 3 gpa + Headline 6 fl oz	183	201	119	20.5	15.4	5502
10-34-0 3 gpa + Vertisan 38 fl oz	190	194	135	22.7	15.1	6042
10-34-0 3 gpa + Picoxystrobin 31 fl oz	139	162	127	22.2	15.9	6299
10-34-0 3 gpa + Serenade 105 fl oz	202	179	71	17.1	15.5	4694
10-34-0 3 gpa + Penthiopyrad 14 g[1] ST[2]	200	198	144	23.4	16.8	7135
10-34-0 3 gpa + Dynasty ST	205	196	79	17.1	15.0	4509
LSD (P=0.05)	**22**	**22**	**34**	**4.5**	**1.2**	**1373**

[1] Penthiopyrad seed-treatment used on different sugarbeet variety than other treatments in this study

[2] ST = seed treatment.