EFFECT OF FUNGICIDES AND STARTER FERTILIZER ON PHYTOTOXICITY AND CONTROLLING RHIZOCTONIA ROOT ROT IN SUGARBEET

Mohamed F. R. Khan[1] and Aaron L. Carlson[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 important soilborne disease of sugarbeet (*Beta vulgaris* L.) in North Dakota and Minnesota. *R. solani* AG-2-2 IV and IIIB are considered the major root rot pathogen and AG-2-2, AG-4, and AG-5 cause damping off of sugarbeet seedlings (Windels and Nabben 1989). *R. solani* survives as thickened hyphae and sclerotia in organic material and is endemic in soils where sugar beet is grown. *R. solani* has a wide host range including broad leaf crops and weeds (Anderson 1982). Severe disease occurs if sugar beet follows beans or potato (Baba and Abe 1966) and both of these crops are used in rotation in the bi-states. Crop rotations of 3 or more years with small grains planted before sugar beet is recommended to reduce disease incidence. 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 2012. The site was inoculated on 30 April with *R. solani* AG 2-2 IIIB grown on barley. Inoculum was applied using a three-point mounted rotary/spinner type broadcast spreader calibrated to deliver 20 lbs/A. The inoculum was incorporated with a Konskilde field cultivator to about two inch depth just before planting. The experimental design was a randomized complete block with four replicates. Field plots comprised of six 25-feet long rows spaced 22 inches apart. Plots were planted to stand on 30 April with Beta 89RR50. 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 20G was also applied at 8.9 lb/A at planting to control insect pests. Weeds were controlled with glyphosate on 24 May, 22 June and 7 August.

The fungicides and rates used are listed in Table 1. Treatments were applied as an in-furrow application. The in-furrow applications were made on 30 April (at planting) using 6.5 gal of spray solution/A. The single Post application was made May 1 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 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

Warm and wet soils resulted in favorable conditions for emergence of sugarbeet seedlings. Several treatments, including Picoxystrobin, and Headline resulted in significantly lower plant stand than the non-treated check. Picoxystrobin also appeared to slow emergence and caused 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 resulted in significantly higher plant stand than the non-treated check. Although Headline and Picoxystrobin did cause some reduction in plant stand early, they did provide good protection against *R. solani* and thus had better plant stand than the non-treated check at harvest. Headline at the 12 oz rate was generally more effective than the 6 oz rate. All the fungicides mixed with starter fertilizer, except Headline at the 6 oz rate, Dynasty, and Serenade resulted in significantly higher recoverable sucrose compared to the non-treated check.

All treatments, including those that had the highest yields, had some stand loss during the season. It is possible that a post-application of an effective fungicide could help to reduce stand loss later in the season and contribute to even higher yields.

Care will have to be taken when using fungicides with starter fertilizer at planting since some mixtures may reduce plant stand. In this trial, treatments were applied immediately after mixing and application was done when the soil temperature at the four inch depth was 55 F. It is possible to have greater stand loss and/or phytotoxicity if the mixture is not properly agitated before application, and in cooler soils.

Table 1. Effect of fungicides and 10-34-0 starter fertilizer on plant stand, and sugarbeet yield and quality at an artificially *Rhizoctonia solani* inoculated site in Glyndon, MN 2012.

Treatment and rate	Plants/ 100 ft row; 22 May	Plants/ 100 ft row; 19 July	Plants/ 100 ft row; 6 Aug	Plants/ 100 ft row; 4 Sept	Yield (T/A)	Sucrose concentrate -tion (%)	Recoverable sucrose (lb/A)
10-34-0 3 gpa	108	95	86	94	30.8	16.3	8,589
Quadris 14.3 fl oz*	128	125	118	113	32.0	15.8	8,769
Quadris 14.3 fl oz	122	116	105	113	30.6	16.0	8,447
10-34-0 3 gpa+ Quadris 14.3 fl oz	99	101	95	88	32.3	15.4	8,425
10-34-0 3 gpa+ Quadris 14.3 fl oz	95	90	88	85	30.0	16.1	8,396
Headline SC 12 fl oz	134	125	121	113	31.8	16.6	9,144
10-34-0 3 gpa+ Vertisan 28.5 fl oz	93	94	93	88	31.4	15.7	8,410
Vertisan 28.5 fl oz	141	127	112	124	32.5	15.5	8,596
LSD (P=0.10)	30.5	NS	NS	23.3	NS	NS	NS

*Applied POST one day after plant.

References

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