EFFECT OF QUADRIS ON 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 devastating soilborne disease of sugarbeet (*Beta vulgaris* L.) in North Dakota and Minnesota. In the bi-state area, *R. solani* anastomosis groups (AGs) AG-1, AG-2-2, AG-4, and AG-5 cause damping off and AG-2-2 causes and 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 sugar beet 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 sugar beet follows beans or potato (Baba and Abe 1966; Johnson et al. 2002). Crop rotations of 3 or more years with small grains planted before sugar beet 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 compared 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).

The objective of this research was to determine the best time to apply Quadris for controlling Rhizoctonia root rot in sugarbeet.

MATERIALS AND METHODS

Field trial was conducted in Hickson, ND in 2010. The Hickson site was inoculated on May 20 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 32 lbs/A. The inoculum was incorporated 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 20 May with an approved 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 four applications of glyphosate. The site was fertilized as recommended for sugarbeet on 19 April; the fertilizer was incorporated with a Kongskilde field cultivator on 20 April.

Quadris was applied at 14.26 fl oz/A in a 7'' band on 2 June, or 23 June, or 2 and 23 June. Treatments were applied using a bike sprayer with flat fan nozzles (4002E) spaced 22'' apart and calibrated to deliver 17 gal solution/A at 40 p.s.i pressure to the middle four rows of plots.

Stand counts were taken during the season and at harvest. The middle two-rows of plots were harvested on 4 October and weights were recorded. The harvested roots were rated for Rhizoctonia root rot (0-7 scale) and 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

Symptoms included wilting, yellowing of leaves, and death of plants. First symptoms appeared in July and infected plants became brown to black carcasses after warm and dry weather conditions in August and early September.

The non-treated inoculated check had significantly lower plant stand starting from early August, significantly greater root rot rating at harvest, lower yield, sucrose concentration and recoverable sucrose than the fungicide treatments. Quadris applied once early (2 June; leaf stage v1.0-1.2; soil temperature at 4" soil depth was 58F), once late (23

June, leaf stage 6-8 lf; soil temperature at 4" soil depth was 68F), or twice (2 and 23 June) resulted in similar plant stands, root rot ratings, yield, sucrose concentration and recoverable sucrose. Soil temperature at the 4 inch depth and moisture was favorable for disease development starting early in the season (at planting, it was 62 F) and continued throughout the season. One application of Quadris was as effective as two applications; similar results were obtained in 2009 (Khan and Carlson, 2010). However, because of the prolonged favorable conditions for disease development, there was a trend of better disease control and higher yields with two applications of Quadris. It may become necessary to use two fungicide applications for effective Rhizoctonia root rot control. However, back-to-back use of Quadris, or any other fungicide should be avoided to delay the development of resistant isolates of *R. solani*. Further research should include rotation of different chemistries of fungicides for controlling Rhizoctonia root rot.

Table 1. Effect of Quadris Applied at Different Times on Rhizoctonia Root Rot Control at Hickson, ND in 2010.

		9 July	11 August	4 October				
Treatment and Rate/A	**Application date**	**Stand Count**	**Stand Count**	**Stand Count**	**Rhizoctonia Root Rating**	**Yield**	**Sucrose concentration**	**Recoverable sucrose**
		beets/50'	**beets/50'**	**beets/50'**	**0-7**	**ton/A**	**%**	**lb/A**
Nontreated check	-	71	55	35	3.4	14.6	16.2	4325
Quadris 14.26 fl oz	2 June	82	75	56	1.6	23.5	17.3	7553
Quadris 14.26 fl oz	23 June	81	77	63	1.3	25.3	17.6	8261
Quadris 14.26 fl oz	2 & 23 June	82	81	67	1.1	28.8	17.5	9362
LSD (P=0.05)		**NS**	**7**	**13**	**1.9**	**6.8**	**1.1**	**2174**

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