EVALUATION OF BAYER SEED TREATMENT FUNGICIDES FOR CONTROL OF RHIZOCTONIA

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Rhizoctonia damping-off and crown and root rot (RCRR) caused by *Rhizoctonia solani* AG 2-2 are increasing on sugarbeet in Minnesota and North Dakota. This soil-borne fungal pathogen causes disease throughout the growing season and reduces stands and sucrose yield and quality. Rhizoctonia diseases are managed through planting partially resistant varieties, cultural practices (e.g., early planting, rotation with cereal crops), and application of fungicides. Currently, commercially sold seed is treated with fungicides that provide only moderate control of Rhizoctonia damping-off, so screening for more effective seed fungicides continues.

OBJECTIVES

A field trial was established to compare performance of non-registered seed treatment products compared to registered products 1) for control of Rhizoctonia diseases and 2) on sugarbeet yield and quality.

MATERIALS AND METHODS

A trial was established at the University of Minnesota, Northwest Research and Outreach Center, Crookston. Plots were fertilized to ensure optimal sugarbeet yield and quality. Soil was infested with *R. solani* (grown on whole barley grains) at 35 kg ha^{-1} and incorporated into the top 4 inches. Then the trial was sown with sugarbeet seed at a 4.7-inch spacing on May 12, 2010. Seed treatments included Vortex (= ipoconazole, which has activity against *Rhizoctonia*) at two rates (2.5 and 5g product/100 kg), L1785 (10g product/100 kg), and two combinations of L1785 + Vortex (5 + 5 and 10 + 5 g /100 kg, respectively). All seed, including the control, was treated with Poncho Beta FS + Allegiance FL + Thiram 42S + Tachigaren 70%AW (68 + 15.5 + 250 + 20 g product per unit of seed). Poncho Beta is applied to control sugarbeet root maggot, Allegiance for Pythium seed rot, Thiram for Pythium and Rhizoctonia damping-off, and Tachigaren for Aphanomyces damping-off. Seed treatments and the control were planted in the four middle rows of six-row plots (rows 22 inches apart, 30 ft long) and replicated four times. Starter fertilizer (10-34-0, 3 gallons A^{-1}) was applied at planting. Weeds were controlled with glyphosate (4.5 lb ae product A^{-1}) on June 2 and July 7 (24 oz A^{-1} each time) and July 23 (28 oz A^{-1}). Cercospora leaf spot was controlled with Super Tin WP80 + Topsin M (5 oz + 0.5 lb product A^{-1} on August 19) and Headline (9 oz product A^{-1} on September 4) in 20 gallons of water using a tractor-mounted sprayer with TeeJet 8002 flat fan nozzles at 100 psi.

Stand counts were made in the two center rows of each treatment at 14, 20, 26, 37 and 47 days after planting. The two centers rows were harvested on September 20 and data were collected for number of harvested roots, yield and quality. Twenty roots per plot also were arbitrarily selected and rated for severity of RCRR using a 0 to 7 scale (0 = healthy root, 7 = root completely rotted and foliage dead).

RESULTS

Soil moisture was excessive and differed among treatments in one replicate, so results were variable and data unreliable. Thus, data are presented for three replicates where soil moisture was uniform.

Stand was very good and equal for all seed treatments and the control at about 14 days after planting (Fig. 1). Rhizoctonia damping-off started to occur across all treatments between 14 to 21 days after planting and by 47 days after planting, stands were statistically the same among all fungicide seed treatments and the control (Fig. 1). At harvest, stands were statistically highest in plots where seed was treated with L1785 + Vortex (5 + 5 g) compared to other seed treatments and the control, which were the same (Table 1).

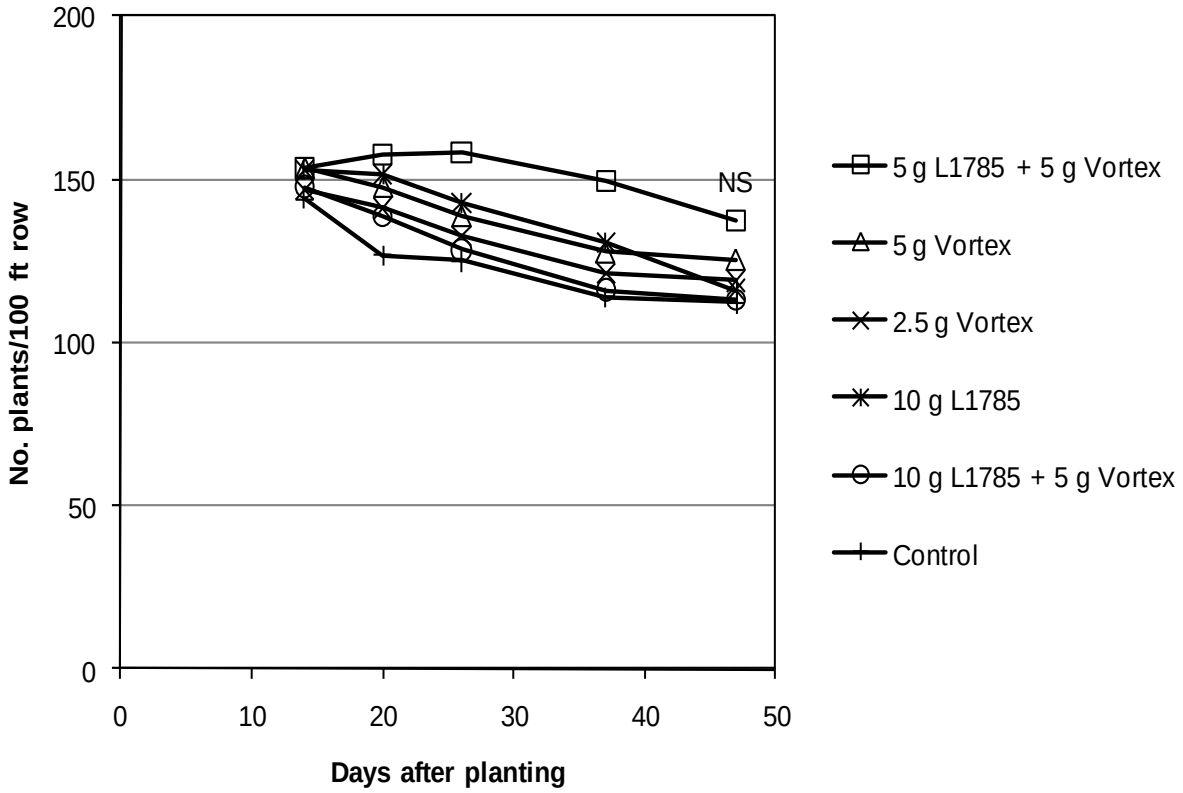

Fig. 1. Stand of sugarbeet seedlings in a field inoculated with *Rhizoctonia solani* and sown with seed treated with various fungicides compared to a non-treated control; all seed also was treated with Poncho Beta, Allegiance, Thiram and Tachigaren (68, 15.5, 250 and 20 g product, respectively, per unit of seed); Poncho Beta is applied to control sugarbeet root maggot, Allegiance for Pythium seed rot, Thiram for Pythium and Rhizoctonia damping-off, and Tachigaren for Aphanomyces damping-off. Each data point is an average of three replicates; NS = not significantly different at $P = 0.05$.

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Table 1. Efficacy of sugarbeet seed treatments sown into a field inoculated with *Rhizoctonia solani* for control of Rhizoctonia crown and root rot (RCRR) and on sugarbeet yield and quality compared to a the control.

Seed treatment[Y]	Rate g product/100 kg seed	No. harv root/100 ft[Z]	RCRR (0-7)[Z]	Yield T/A[Z]	Sucrose[Z] %	Sucrose[Z] lb/ton	Sucrose[Z] lb recov./A
Control		102	2.6	19.6	16.5	306	5987
Vortex	2.5	100	3.2	18.6	17.3	325	6066
Vortex	5.0	103	3.4	17.3	16.6	310	5339
L1785	10.0	106	3.0	17.5	16.7	313	5469
L1785 + Vortex	5.0 5.0	137	2.2	21.5	16.8	314	6762
L1785 + Vortex	10.0 5.0	101	3.6	18.5	16.8	314	5819
P-value		0.066	0.141	0.130	0.725	0.704	0.123
C.V. (%)[Z]		13.2	20.2	9.5	3.8	4.5	9.8

[Y] Poncho/Beta FS (68 g product/unit), Allegiance FL (15.5 g product/100 kg), Thiram 42S (250 g product/100 kg), and Tachigaren 70% AW (20 g product/unit) on all seed. Poncho Beta is applied to control sugarbeet root maggot, Allegiance for Pythium seed rot, Thiram for Pythium and Rhizoctonia damping-off, and Tachigaren for Aphanomyces damping-off.

[Z] Each data value is an average of three replicates; C.V. = coefficient of variation

Rhizoctonia root and crown rot was statistically the same in all plots planted with fungicide-treated seed and the control, but disease tended to be lowest in plots sown with seed treated with L1785 + Vortex (5 + 5 g) (Table 1). Root and sucrose yields were statistically the same for all seed treatments and the control (Table 1). There was a trend, however, for root and sucrose yields to be highest in plots planted to seed treated with L1785 + Vortex (5 + 5g) compared to other seed treatments and the control (Table 1).

DISCUSSION AND CONCLUSIONS

In our trial, none of the seed treatment fungicides controlled Rhizoctonia damping-off, although early-season disease pressure from *R. solani* appeared to be uniform across the trial and occurred at a moderate level. Seed treatment fungicides decompose within a few weeks after seed is sown and would not be expected to control Rhizoctonia crown and root rot. By harvest, plots where seed was treated with L1785 + Vortex (5 + 5 g product per 100 kg seed) had significantly higher stands than other seed treatments and the control and also tended to have lower RCRR ratings and higher root and sucrose yields compared to the other seed treatments and control. It is unknown why L1785 + Vortex (5 + 5 g product per 100 kg seed) tended to be more effective than when applied individually or when combined at another rate.

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