CONTROL OF SUBTERRANEAN SPRINGTAILS IN SUGARBEET USING INSECTICIDAL SEED TREATMENTS AND CONVENTIONAL GRANULAR INSECTICIDES

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Introduction:

Subterranean (soil-dwelling) springtails are frequent sugarbeet pests for many growers in the central and southern Red River Valley (RRV) of Minnesota and North Dakota. These pests also have occasionally caused major yield losses for producers in western ND and eastern Montana in the past decade. Springtails are most commonly known to feed on decaying soil organic matter. As such, infestations can build up in the heavy soils with high organic matter content that are common to the RRV. They injure sugarbeet seedlings by using chewing mouthparts. Injury is sometimes sufficiently severe to kill young sugarbeet seedlings, resulting in stand losses and, consequently, major yield reductions. This experiment was carried out to evaluate the performance of insecticidal seed treatments and a conventional granular insecticide at low application rates for springtail control in sugarbeet.

Materials & Methods:

This experiment was established on the NDSU experiment farm near Prosper, ND. Plots were planted on 18 May, 2016 using a 6-row Monosem NG Plus 7x7 planter set to plant at a depth of 1¼ inch and a rate of one seed every 4½ inches of row length. Betaseed 89RR52, a glyphosate-tolerant seed variety, was used for all treatments. Individual treatment plots were two rows (22-inch spacing) wide and 25 feet long, and 20-ft wide tilled alleys were maintained between replicates throughout the growing season. The experiment was arranged in a randomized complete block design with four replications of the treatments. Two-row plots are the preferred experimental unit size in springtail trials because infestations of these pests are typically patchy. A smaller test area increases the likelihood of having a sufficiently uniform springtail infestation among plots within each block.

Insecticidal seed treatment materials were applied to seed by Germain's Technology Group (Fargo, ND). Granular insecticide treatments were applied by using band placement (Boetel et al. 2006), which consisted of 5-inch swaths that were delivered through Gandy™ row banders. Output rates of the planting-time standard granular material used this experiment were regulated by using a planter-mounted SmartBox™ computer-controlled insecticide delivery system that was calibrated on the planter immediately before all applications.

Treatment efficacy was compared by using plant stand counts and yield parameters because subterranean springtails cause stand losses that lead to yield reductions. Stand counts involved counting all living plants within each 25-ft long row. Plant stand counts were taken on June 9 and 21, which were 22 and 34 days after planting (DAP), respectively. Raw stand counts were converted to plants per 100 linear row ft for the analysis. Plots were harvested on 13 September by using a 2-row mechanical harvester to collect all beets from both rows of each plot. Subsamples of 12-18 harvested beets were sent to the American Crystal Sugarbeet Quality Laboratory (East Grand Forks, MN) for quality analyses. All stand count and yield data were subjected to analysis of variance (ANOVA) using the general linear models (GLM) procedure (SAS Institute, 2008), and treatment means were separated using Fisher's protected least significant difference (LSD) test at a 0.05 level of significance.

Results and Discussion:

Stand count data for this trial are presented in Table 1. All insecticide treatments provided significant levels of protection from stand loss due to springtail injury at both 22 and 34 DAP when compared to the untreated check, irrespective of whether a granule or seed treatment was used. There were no statistical differences in stands among seed treatment entries at either stand count date. At the first count (i.e., 22 DAP), Cruiser and Poncho Beta performed at levels that were not significantly different from that of Counter 20 applied at 5.9 lb product/ac, which was the top-performing treatment with respect to plant protection from stand loss. Similarly, at 34 DAP, the stand protection from Cruiser was not significantly different from that of the 5.9-lb application of Counter.

At the final stand count date (34 DAP), surviving plant stands in plots treated with the higher (5.9 lb/ac) rate of Counter 20G were significantly greater than those treated with the low (4.5 lb/ac) rate. We generally have not observed rate- associated differences in springtail control with Counter in previous experiments; however, these are the lowest rates of Counter we have ever tested for this use.

Table 1. *Plant stand counts* from evaluation of planting-time granular and seed treatment insecticides for springtail control, Prosper, ND, 2016

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb ai/ac)	Stand count[b] (plants / 100 ft.)	
				22 DAP[b]	34 DAP[b]
Counter 20G	B	5.9 lb	1.2	212 a	214 a
Cruiser 5FS	Seed		60 g a.i./ unit seed	209 ab	208 ab
Poncho Beta	Seed		68 g a.i./ unit seed	202 ab	200 b
Counter 20G	B	4.5 lb	0.9	216 a	199 b
NipsIt Inside	Seed		60 g a.i./ unit seed	195 b	196 b
Check	---	----	---	134 c	140 c
LSD (0.05)				16.5	13.3

Means within a column sharing a letter are not significantly (P = 0.05) different from each other (Fisher's Protected LSD test).

[a]B = banded at planting; Seed = insecticidal seed treatment

[b]DAP = Days after planting. Surviving plant stands were counted on June 9 and 21, 2016 (22 and 34 DAP, respectively).

Yield results from this experiment are presented in Table 2. General treatment performance patterns were similar to those observed in stand count results. Both rates of Counter 20G, as well as the Poncho Beta and NipsIt Inside seed treatments, resulted in significantly greater recoverable sucrose yield than the untreated check. The only treatment that did not provide a significant increase in recoverable sucrose yield when compared to the untreated check was Cruiser 5FS seed treatment. Root yield comparisons revealed that the higher (5.9 lb/ac) rate of Counter 20G and Poncho Beta seed treatment were the only entries in the trial that resulted in significantly greater tonnage than the untreated check; however, it should be noted that these treatments were not statistically different from each other, and they did not significantly differ from NipsIt Inside seed treatment in relation to root yield.

Table 2. *Yield parameters* in comparison of planting-time granular and seed treatment insecticides for springtail control, Prosper, ND, 2016

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb a.i./ac)	Sucrose yield (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Counter 20G	B	5.9 lb	1.2	9349 a	31.5 a	16.25 a	1011
Poncho Beta	Seed		68 g a.i./ unit seed	9034 ab	28.1 ab	17.23 a	1091
NipsIt Inside	Seed		60 g a.i./ unit seed	8381 ab	26.5 abc	16.93 a	990
Counter 20G	B	4.5 lb	0.9	8212 b	26.1 bc	16.93 a	964
Cruiser 5FS	Seed		60 g a.i./ unit seed	7937 bc	24.5 bc	17.35 a	965
Check	---	----	---	7039 c	21.7 c	17.28 a	856
LSD (0.05)				1129.4	5.35	NS	

Means within a column sharing a letter are not significantly (P = 0.05) different from each other (Fisher's Protected LSD test).

[a]B = banded at planting; Seed = insecticidal seed treatment

All granular and seed treatment insecticide products used in this trial resulted in gross economic returns of at least $109/ac, which would easily justify their use in protecting sugarbeet from springtail feeding injury and associated yield losses. The highest gross economic return was achieved in plots protected by Poncho Beta seed treatment, which produced $235 more gross revenue per acre than the untreated check. Similarly, plots treated with the higher rate of Counter 20G (5.9 lb/ac) generated $155/ac more revenue than the check. Quality of harvested roots was the main factor that resulted in more revenue from Poncho Beta plots than those treated with Counter. The Poncho Beta plots produced roots with an average sucrose content of 17.23%, whereas the sucrose content in roots from plots treated with Counter ranged from 16.25 to 16.93%. The increases in yield and revenue generated by the insecticide treatments tested in this experiment demonstrate that they are effective tools for managing subterranean springtails in sugarbeet. These findings also underscore the significance of springtails as pests of sugarbeet and demonstrates the economic value of effective springtail management.

References Cited:

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