SPRINGTAIL MANAGEMENT IN SUGARBEET: A PERFORMANCE COMPARISON OF INSECTICIDAL SEED TREATMENTS AND GRANULAR SOIL INSECTICIDES

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Introduction:

Since the late-1990s, subterranean springtails (Collembola) have been recognized as a significant pest threat of sugarbeet for many growers in the Red River Valley of Minnesota and North Dakota. Subterranean springtails can also be problematic for producers in the sugarbeet-growing areas of western ND and eastern Montana. These blind, wingless insects are referred to as "subterranean" because they usually spend their entire lives below the soil surface (Boetel et al. 2001).

Previous research suggests that these tiny, nearly microscopic, pests are capable of causing revenue losses of over $400 per acre in the absence of effective control (Boetel et al. 2007). Optimal environmental conditions, such as heavy soils, cool and wet weather, and high levels of soil organic matter, can be conducive to buildups of springtail infestations that cause major plant stand reductions and associated yield and revenue losses in sugarbeet production. As such, long periods of cool and rainy weather during the first few weeks after planting can put fields at increased risk for springtail injury. This experiment was carried out to compare the performance of conventional granular insecticides and three currently registered insecticidal seed treatments for springtail control in sugarbeet.

Materials & Methods:

This experiment was established on a commercial field site near Eldred, MN. SES VanderHave SV36917RR (glyphosate-resistant) seed was used for all treatments in this experiment, and all seed treatment insecticides were applied to seed by a custom seed-coating company (Germains Seed Technology, Fargo, ND). Plots were planted on May 4, 2012 by using a 6-row John Deere 71 Flex planter that was set to plant seed 1¼-inch deep and spaced every 4½ inches of row. The experiment was arranged in a randomized complete block design with four replications. Individual treatment plots were 35 ft long by two rows (22-inch spacing) wide with 25-ft wide, plant-free alleys between replicates. Two-row plots are the preferred experimental unit configuration in springtail efficacy trials because these insects typically inhabit fields in a patchy, non-uniform distribution. As such, the smaller test area increases the likelihood of having more uniform infestations within replicates of the experiment.

Granular insecticide treatments were applied at planting by using planter-mounted band (B) or spoon (S) placement methodology (Boetel et al. 2006). Banded applications consisted of 5-inch swaths delivered through Gandy™ row banders. Spoon placement was achieved by delivering granules down the in-furrow drop tube to the end of which a galvanized metal spoon-like device was attached. A #10 bolt was inserted in the center of the spoon and fastened with two hex shaped nuts facing upward on the concave side of the spoon. The nut/bolt combination deflected most of the granular output to either side of the seed furrow, thus minimizing the concentration of granules deposited into close proximity to the seed. Granular insecticide output rates were regulated by using planter-mounted Noble™ metering units that were calibrated on the planter before all applications.

Treatment performance was compared using plant stand counts and yield parameters. Stand counts involved counting all living plants in both 35-ft long rows of each plot. Counts were taken on May 17 and 31, June 7, 19, and 26, and July 12 and the data were converted to plants per 100 linear row ft. For the sake of brevity, only the final stand count data (i.e., July 12, 53 days after planting) are included in this report.

Yield data were collected by harvesting both rows of each plot on September 12 using a 2-row mechanical harvester. A subsample of 12-18 harvested beets was collected from each plot and 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 using the general linear models 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:

All insecticide treatments, irrespective of application rate or whether a seed treatment or granular insecticide was used, provided significant levels of protection from springtail-associated stand loss when compared to the stand counts in the untreated check plots (Table 1). The use of Counter 20G, applied in a band at 4.5 lb product/ac, and Poncho Beta insecticidal seed treatment resulted in the highest surviving plant stands in the experiment, and the plant stands in these entries were significantly greater than the stand recorded in plots planted with NipsIt Inside seed treatment. There were no significant differences in stand protection between application rates or placement methods of Counter 20G.

Table 1. *Plant stand counts* from evaluation of planting-time granules and insecticidal seed treatments for springtail control, Eldred, MN, 2012

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb ai/ac)	Stand count[b] (plants / 100 ft)
Poncho Beta	Seed		68 g a.i. / unit seed	176 a
Counter 20G	B	4.5 lb	0.9	173 ab
Counter 20G	B	5.9 lb	1.2	170 abc
Counter 20G	B	7.5 lb	1.5	170 abc
Cruiser 5FS	Seed		60 g a.i. / unit seed	158 abc
Counter 20G	S	4.5 lb	0.9	155 bc
NipsIt Inside	Seed		60 g a.i. / unit seed	152 c
Check	---	----	---	124 d
LSD (0.05)				19

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

[a] B = Band; S = spoon; Seed = insecticidal seed treatment

[b] Surviving plant stand on July 12 (53 days after planting)

All insecticide-protected plots, irrespective of whether a seed treatment or Counter 20G was used, produced greater recoverable sucrose yields than the untreated check plots (Table 2); however, there were no significant differences between any insecticide treatments. In comparison to the untreated check, the sucrose yield increases ranged from 1,054 lb of additional sucrose for the banded application of Counter 20G at its low (4.5 lb product/ac) labeled rate to a 2,016-lb increase from plots treated with Counter 20G at its moderate (7.5 lb product/ac) rate.

Table 2. *Yield parameters* from comparison of planting-time granules and insecticidal seed treatments for springtail control, Eldred, MN, 2012

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	7.5 lb	1.5	10382 a	31.8 a	18.05 abcd	1747
Counter 20G	B	5.9 lb	1.2	10103 a	30.5 ab	18.25 abc	1726
Counter 20G	S	4.5 lb	0.9	10052 a	29.7 ab	18.53 a	1749
Poncho Beta	Seed		68 g a.i. / unit seed	9731 a	31.1 a	17.50 d	1573
NipsIt Inside	Seed		60 g a.i. / unit seed	9669 a	30.0 ab	17.90 bcd	1608
Cruiser 5FS	Seed		60 g a.i. / unit seed	9479 a	29.3 ab	17.95 abcd	1585
Counter 20G	B	4.5 lb	0.9	9420 a	28.0 bc	18.40 ab	1630
Check	---	----	---	8366 b	26.1 c	17.75 cd	1383
LSD (0.05)				1033	2.8	0.60	

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

[a] B = band; S = spoon; Seed = insecticidal seed treatment

All insecticide treatments, except the banded application of Counter 20G at its low (4.5 lb product/ac) application rate, provided significant increases in sugarbeet root yield when compared to the untreated check. Plots treated with a banded application of Counter 20G at 7.5 lb product/ac produced the highest average root yields in this experiment. The root yield from those plots was significantly greater that from plots treated with the banded application of Counter at the low, 4.5 lb product/ac rate. Plots planted with Poncho Beta-treated seed also produced significantly greater root yield than that in plots treated with the banded application of Counter at 4.5 lb/ac.

Gross economic returns in this experiment were increased by $190, $202, and $225/ac for Poncho Beta, Cruiser, and NipsIt Inside, respectively, over that from the untreated check. Revenue increases from Counter 20G ranged from $343/ac when it was banded at 5.9 lb product/ac to $366/ac when it was spoon-applied at 4.5 lb/ac.

Despite the presence of a slightly lower springtail infestation in this experiment, the gross revenue benefits from some of the better-performing treatments support our previous findings on springtail management in sugarbeet. Results from those trials showed that these pests can cause revenue losses that approach, and occasionally exceed, $400 per acre in the absence of effective control (Boetel et al. 2007). The overall findings of this experiment illustrate the economic significance of subterranean springtails as pests of sugarbeet in the Red River Valley production area and, as such, underscore the importance of effectively managing them. Successful management of subterranean springtails is likely to be achieved by growers that elect to apply either a low to moderate rate of Counter 20G at planting time or plant seed that is treated with any of the insecticidal seed treatments used in this study.

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