SPRINGTAIL CONTROL IN THE MONDAK SUGARBEET PRODUCTION AREA:
A COMPARISON OF GRANULAR, SPRAYABLE LIQUID, AND SEED-APPLIED INSECTICIDES

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Introduction:

Springtails belong to the order Collembola, an order of organisms that is so unique that they are technically not true insects. These tiny, nearly microscopic, blind, and wingless insects spend their entire lives below the soil surface (Boetel et al. 2001). Subterranean springtails tend to thrive in heavy soils with high levels of soil organic matter. Cool and wet weather can be conducive to buildups of springtail infestations because such conditions slow sugarbeet seed germination and seedling development, which renders plants extremely vulnerable to attack by springtails that are not negatively impacted by cool temperatures. Therefore, these pests can cause major stand and yield losses.

Subterranean (soil-dwelling) springtails have been recognized as a serious pest threat of sugarbeet for many growers in the central and southern Red River Valley of Minnesota and North Dakota since the late-1990s. However, in recent years, sugarbeet producers in the western ND and eastern Montana (MonDak) growing area have also experienced significant yield and revenue losses due to major springtail infestations. In some cases, the infestations have been sufficiently severe as to result in failures of some insecticidal approaches aimed at controlling them. We conducted a field experiment in the MonDak growing area to achieve the following objectives in relation to MonDak-area springtail infestations: 1) screen the performance of Counter 20G, a conventional granular insecticide, at different application rates; 2) evaluate the efficacy of both T-banded and dribble in-furrow applications of Mustang Maxx liquid insecticide at its maximum labeled rate; 3) compare the efficacy provided by neonicotinoid insecticidal seed treatments (i.e., Cruiser, NipsIt Inside, and Poncho Beta); and 4) determine if springtail management in sugarbeet can be optimized by combining a planting-time application of Mustang Maxx with Poncho Beta-treated seed.

Materials & Methods:

This experiment was established in a grower-owned sugarbeet field near Trenton (Williams County) in northwestern, ND. Plots were planted on 2 May, 2019 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 8524, 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 25-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. *NOTE: 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 replicate of the experiment.*

Insecticidal seed treatment materials were applied to seed by Germain's Technology Group (Fargo, ND). Counter 20G insecticide granules were applied by using band placement (Boetel et al. 2006), which consisted of 5-inch swaths delivered through Gandy™ row banders. Planting granular output rates were regulated by using a planter-mounted SmartBox™ computer-controlled insecticide delivery system that was calibrated on the planter immediately before all applications.

Bifender FC was applied as 3-inch T-bands or by using dribble-in-furrow (DIF) placement. T-band placement was achieved by orienting the output fan of each nozzle (TeeJet™ 400067E) to be directly perpendicular to the row, and nozzle height was adjusted on each row to achieve the desired 3-inch band width over the open seed furrow. Dribble in-furrow applications were made by orienting microtubes (1/4" outside diam.) directly into the open seed furrow. Inline Teejet™ No.29 orifice plates were used to stabilize the output rate of the spray solutions from the microtubes.

Treatment efficacy was compared by using surviving plant stand counts because subterranean springtails cause early-season stand losses that can lead to yield reductions. Stand counts involved counting all living plants within each 25-ft-long row. Plant stand counts were taken on 15, 21, and 29 May, 2019, which were 13, 19, and 27 days after planting (DAP), respectively. Raw stand counts were converted to plants per 100 linear row feet for the analysis. All stand count 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:

Plant stand count data for this trial appear in Table 1. The treatments in the table are presented in descending order of performance as observed at the last stand count (27 DAP). As such, the best-performing treatment is listed in the top row, and the treatment in which the lowest surviving plant stands were observed appears in the bottom row.

Table 1. *Plant stand counts* from a field trial on planting-time granular, liquid, and seed treatment insecticides for springtail control, Trenton, ND, 2019

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb ai/ac)	Stand count[b] (plants / 100 ft)		
				13 DAP[c]	19 DAP[c]	27 DAP[c]
Mustang Maxx	3" T-band	4 fl oz	0.025	121.3 a	180.7 a	224.7 a
Poncho Beta + Mustang Maxx	Seed 3" T-band	4 fl oz	68 g a.i./ unit seed 0.025	120.7 a	180.7 a	218.7 ab
Counter 20G	B	7.5 lb	1.5	136.0 a	182.0 a	216.7 ab
Counter 20G	B	4.5 lb	0.9	124.7 a	174.0 ab	214.0 abc
Counter 20G	B	5.9 lb	1.2	113.3 a	186.7 a	210.0 a-d
Poncho Beta + Mustang Maxx	Seed DIF	4 fl oz	68 g a.i./ unit seed 0.025	106.0 a	180.0 a	208.7 a-e
NipsIt Inside	Seed		60 g a.i./ unit seed	112.7 a	172.0 ab	204.7 b-f
Cruiser 5FS	Seed		60 g a.i./ unit seed	74.7 a	139.3 c	195.3 c-f
Mustang Maxx	DIF	4 fl oz	0.025	111.3 a	142.7 c	191.3 def
Poncho Beta	Seed		68 g a.i./ unit seed	110.7 a	155.3 bc	190.0 ef
Untreated check	---	----	---	111.3 a	152.7 bc	188.7 f
LSD (0.05)				NS	22.99	19.93

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; T-band = 3" swath over open seed furrow at planting; Seed = insecticidal seed treatment
[b]Surviving plant stands were counted on May 15, 21, and 29, 2019 (i.e., 13, 19, and 27 days after planting, respectively).
[c]DAP = Days after planting

At the initial stand count (13 DAP) there were no significant differences in plant densities between treatments; however, performance patterns observed at that time suggested that the T-banded application of Mustang Maxx was providing slightly better seedling protection than the dribble in-furrow (DIF) application of Mustang. Another general pattern observed was that Counter 20G provided slightly, albeit not significantly, better stand protection than the insecticidal seed treatments and DIF-applied Mustang Maxx.

The highest plant stands at the second stand count date (19 DAP) were recorded in plots protected by the following treatments: 1) Counter 20G (5.9 and 7.5 lb product/ac); 2) T-banded Mustang Maxx; 3) T-banded Mustang Maxx + Poncho Beta-treated seed; and 4) DIF-applied Mustang + Poncho Beta-treated seed. These treatments were statistically superior to all other treatments in the trial at 19 DAP, except Counter 20G at 4.5 lb product per acre and NipsIt Inside. Treatments that failed to show a significant increase in surviving plant stands when compared to the untreated check at 19 DAP included the following (listed in decreasing order of performance): Cruiser 5FS seed treatment, the DIF application of Mustang Maxx, Poncho Beta alone, NipsIt Inside, and the low (4.5 lb/ac) rate of Counter 20G.

At the final stand count (27 DAP), the highest stand protection occurred in plots protected by the following treatments (ranked in descending order of performance): 1) T-banded Mustang Maxx; 2) T-banded Mustang Maxx + Poncho Beta-treated seed; 3) Counter 20G at 7.5 lb/ac; 4) Counter 20G at 4.5 lb/ac; 5) Counter 20G at 5.9 lb/ac; and 6) the DIF application of Mustang Maxx. Although these top six treatments were not significantly different from each other in stand protection, performance patterns observed during the first two stand counts were repeated, and suggested that the 3-inch T-band was generally superior to DIF placement for applying Mustang Maxx. A second general observation that was that planting-time applications of Counter 20G tended to perform better than insecticidal seed treatments, and all rates of Counter 20G resulted in significantly greater plant stands than Poncho

Beta. Another overall finding was that there were no statistical differences among insecticidal seed treatments, although trends suggested slightly better performance from NipsIt Inside than the other seed treatment insecticides.

These findings demonstrate the significance of subterranean springtails as serious economic pests of sugarbeet and also illustrate the importance of effectively managing them. MonDak area growers planning to grow sugarbeet in areas with a known history of problems with springtails, especially in areas of reported seed treatment insecticide failures, should seriously consider using one of the better-performing control tools from this trial. If choosing to use a planting-time application of Mustang Maxx, it is strongly recommended that the product be applied in 3-inch T-bands to optimize performance. If that is not a practical option, Mustang Maxx should probably be integrated with a neonicotinoid insecticidal seed treatment of the grower's choosing. Another effective option would be to equip the planter with granular application technology, and protect the crop from springtail infestations with planting-time bands of Counter 20G.

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