REGISTERED SEED TREATMENTS AND GRANULAR INSECTICIDES FOR SUGARBEET ROOT MAGGOT CONTROL

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Introduction:

Seed treatment insecticides have been widely adopted in recent years by Red River Valley producers for insect pest management in sugarbeet. Although seed treatment insecticides are labeled for use against several soil-dwelling insect pests in sugarbeet, the sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder), is a key target pest of many growers in the region. Most research conducted by NDSU thus far suggests that conventional granular insecticides tend to provide greater levels of protection from SBRM feeding injury than those provided by insecticidal seed treatments. However, the latter have not been evaluated as extensively for root maggot control as the granular insecticide products that have been registered for use in sugarbeet for decades. This experiment was carried out to assess the relative efficacy of Cruiser 5FS, NipsIt Inside, and Poncho Beta insecticidal seed treatments and compare their performance to that of two conventional organophosphate granular insecticides (i.e., Counter 20G and Lorsban 15G) under high sugarbeet root maggot infestations.

Materials and Methods:

A commercial field site near St. Thomas (Pembina County), ND was chosen to conduct this experiment. SES VanderHave 36917RR, a glyphosate-resistant sugarbeet seed variety, was used for all treatment plots. Insecticidal seed treatment materials were applied to seed by a custom seed-coating company (Germains Seed Technology, Fargo, ND). The experiment was planted on 9 May, 2012 by using a 6-row John Deere™ 71 Flex planter. The planter was adjusted to plant at a depth of 1¼ inch and to deliver one seed every 4¾ inches of row. Each plot was 35 feet long by 6 rows (22-inch spacing) wide with the 4 centermost rows treated. The outer "guard" row to each side of the plot served as an untreated buffer. Plant-free, tilled alleys were maintained between replicates throughout the growing season. The experiment was arranged in a randomized complete block design with four replications. Planter seed hoppers were completely disassembled, cleaned, and re-assembled after the application of each individual treatment to avoid cross-contamination (e.g., unintended seed delivery or transfer of insecticide-containing dust and seed coating material) between treatments.

Granular insecticides were applied by using band (B) placement, which consisted of delivery in 5-inch swaths from Gandy™ row banders. Granular output rates were regulated by using planter-mounted Noble™ metering units that were calibrated on the planter before planting.

Root injury ratings: Root maggot feeding injury was assessed in the plots on 7 August by randomly collecting root samples, hand-washing them, and scoring them in accordance with the 0 to 9 root injury rating scale (0 = no scarring, and 9 = over ¾ of the root surface blackened by scarring or dead beet) of Campbell et al. (2000). Five roots were rated from each of the outer two treated rows of each plot.

Harvest: In addition to SBRM feeding injury, treatment performance was also compared on the basis of sugarbeet yield and quality parameters. All plots for this experiment were harvested on 18 September. Immediately before harvest, the foliage from all plants in each plot was removed by using a commercial-grade mechanical defoliator. After defoliation, all beets from the center 2 rows of each plot were extricated from soil using a mechanical harvester and weighed in the field using a digital scale. A representative subsample of 12-18 beets was collected from each plot and sent to the American Crystal Sugar Company Tare Laboratory (East Grand Forks, MN) for sucrose content and quality analysis.

Data analysis: All data from root maggot feeding injury ratings and harvest samples were subjected to analysis of variance using the general linear models procedure in SAS (SAS Institute, 2008), and treatment means were compared by using Fisher's protected least significant difference (LSD) test at a 0.05 level of significance.

Results and Discussion:

Sugarbeet root maggot feeding injury results from this experiment are presented in Table 1. Root injury ratings from the untreated check plots averaged 7.45 on the 0 to 9 scale of Campbell et al. (2000), which suggested that a relatively high SBRM infestation was present for this study. All insecticide-protected plots, irrespective of whether a seed treatment or granular insecticide was applied, had significantly less root maggot feeding injury than the untreated check plots.

The highest labeled rate (8.9 lb product/ac) of Counter 20G provided significantly greater root protection than all of the seed treatment materials. There were no significant differences in root protection between application rates of Counter 20G or between rates of Lorsban 15G, but both rates of Counter 20G were statistically superior to Lorsban 15G, irrespective of which rate of Lorsban was used. This has not been observed in previous years of testing on sugarbeet control using Lorsban 15G.

As has been the case in similar trials from previous years, there were no significant differences among seed treatment entries in this experiment with regard to protection from root maggot feeding injury.

Table 1. ***Larval feeding injury ratings*** **from a comparison of registered seed treatments and granular insecticides for at-plant control of sugarbeet root maggot, St. Thomas, ND, 2012**

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb a.i./ac)	Root injury (0-9)
Counter 20G	B	8.9 lb	1.8	5.23 d
Counter 20G	B	7.5 lb	1.5	5.53 cd
NipsIt Inside	Seed		60 g a.i./ unit seed	6.15 bc
Cruiser 5FS	Seed		60 g a.i./ unit seed	6.23 bc
Lorsban 15G	B	10 lb	1.5	6.38 b
Lorsban 15G	B	13.4 lb	2.0	6.53 b
Poncho Beta	Seed		68 g a.i./ unit seed	6.65 b
Check	---	----	---	7.45 a
LSD (0.05)				0.76

Means within a column sharing a letter are not significantly (P = 0.05) different from each other (Fisher's Protected LSD).
[a]B = band; Seed = insecticidal seed treatment

Yield and quality results from this experiment appear in Table 2. The highest recoverable sucrose yield in this trial at St. Thomas was achieved by using the high (8.9 lb product/ac) rate of Counter 20G; however, the sucrose yields from those plots were not significantly different from plots treated with the moderate (7.5 lb product/ac) rate of Counter, NipsIt seed treatment, or Lorsban 15G (10 lb product/ac). In addition to all of these entries, the other treatment that produced a significant increase in recoverable sucrose per acre over that of the untreated check was Poncho Beta seed treatment. Entries that did not result in statistically significant increases in sucrose yield compared to the check included Cruiser seed treatment and Lorsban 15G (13.4 lb product/ac). Sucrose yield enhancements (i.e., increases above the untreated check), although not always statistically significant, ranged from 945 lb recoverable sucrose per acre for plots treated with Lorsban 15G (13.4-lb rate) to 2,903 lb/ac for the 8.9-lb rate of Counter 20G.

All insecticide-treated plots, except those planted using Cruiser-treated seed, produced significantly greater root yields than the untreated check plots in this study. Root tonnage benefits from insecticide protection ranged between 4.3 tons/ac for Lorsban 15G (13.4 lb) and 7.6 tons/ac for the high rate (8.9 lb) of Counter 20G. The use of Cruiser for SBRM control resulted in an average increase in root yield of 3.9 tons/ac when compared to the untreated check; however, variability resulted in this apparent difference being statistically nonsignificant.

Revenue comparisons also indicated major benefits from insecticidal protection in this experiment. Even the lowest-yielding insecticide-protected plots (Lorsban 15G at 13.4 lb product/ac) resulted in an average revenue benefit of $83/ac. As was observed with the yield comparisons, plots protected with Counter 20G applications produced the greatest revenue benefits among all insecticide-treated entries. When compared to the revenue recorded for the untreated checks, Counter-treated plots produced revenue increases of $428 and $553/ac for the 7.5-lb and 8.9-lb rates, respectively. Revenue increases from NipsIt Inside, Poncho Beta, and Cruiser were $321, $129, and $230/ac in comparison to the untreated check plots, thus indicating that these materials generate sufficient revenue to easily recover the added input cost associated with insecticide-treated seed (i.e., $25-38/ac).

Table 2. ***Yield parameters*** **in comparison of registered seed treatments and granular insecticides for at-plant control of sugarbeet root maggot, St. Thomas, ND, 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	8.9 lb	1.8	6951 a	20.8 a	18.00 a	1195
Counter 20G	B	7.5 lb	1.5	6523 ab	20.5 a	17.28 ab	1070
NipsIt Inside	Seed		60 g a.i./ unit seed	6078 abc	19.8 a	16.83 bcd	963
Lorsban 15G	B	10 lb	1.5	5776 abc	19.8 a	16.13 cde	862
Poncho Beta	Seed		68 g a.i./ unit seed	5453 bc	19.5 a	15.68 e	771
Cruiser 5FS	Seed		60 g a.i./ unit seed	5368 bcd	17.1 ab	17.15 abc	872
Lorsban 15G	B	13.4 lb	2.0	4993 cd	17.5 a	15.90 de	725
Check	---	----	---	4048 d	13.2 b	16.80 bcde	642
LSD (0.05)				1365	4.0	1.13	

Means within a column sharing a letter are not significantly (P = 0.05) different from each other (Fisher's Protected LSD).
[a]B = band; Seed = insecticidal seed treatment

The performance of Lorsban 15G in this experiment was surprisingly poor, and did not reflect the findings of previous trials involving this product for SBRM control. The reason for this is unclear; however, the fact that plots treated with the high rate (13.4 lb/ac) of Lorsban 15G produced 783 lb less recoverable sucrose and 2.3 tons less root yield than plots treated with the lower (10-lb) rate could indicate that a misapplication of the product occurred. These alarming results strongly suggest that further screening be done to determine their repeatability and the likelihood of such losses occurring for sugarbeet producers who prefer using this product for insect management on their farms.

References Cited:

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