REGISTERED SEED TREATMENTS AND CONVENTIONAL GRANULAR INSECTICIDES FOR SUGARBEET ROOT MAGGOT CONTROL

Mark A. Boetel, Professor
Jacob J. Rikhus, Research Associate
Allen J. Schroeder, Research Specialist

Department of Entomology, North Dakota State University, Fargo, ND

Introduction:

Since 2009, insecticidal seed treatment materials have been widely used by sugarbeet producers for insect pest management in the Red River Valley growing area of North Dakota and Minnesota. Previous research at North Dakota State University has shown that the performance of these materials varies according to which insect species is being targeted. This experiment was carried out to compare the relative efficacy provided by Cruiser 5FS, NipsIt Inside, and Poncho Beta insecticidal seed treatments with that of two conventional granular insecticide products (i.e., Counter 20G and Lorsban 15G) for control of the sugarbeet root maggot, (SBRM), *Tetanops myopaeformis* (Röder). A secondary objective was to assess the impact of application rate on the efficacy provided by the two granular materials.

Materials and Methods:

A commercial field site near St. Thomas (Pembina County), ND was chosen to conduct this experiment. All insecticidal seed treatment materials were applied to seed by a custom seed-coating company (Germains Seed Technology, Fargo, ND). The experiment was planted on 29 May, 2014 by using a 6-row John Deere™ 71 Flex planter. The planter was adjusted to plant seeds at a depth of 1¼ inch and a rate of one seed every 4½ inches of row length. Betaseed 89RR83, a glyphosate-resistant sugarbeet seed variety, was used for all treatment plots. Each plot was 6 rows (22-inch spacing) wide with the 4 centermost rows treated. The outer "guard" row on each side of the plot served as an untreated buffer. Each plot was 35 feet long, and 25-foot 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. To avoid cross-contamination of seed between treatment applications, planter seed hoppers and seed dispensation equipment were completely disassembled, cleaned, and re-assembled after the application of each treatment.

Counter 20G and Lorsban 15G served as planting-time granular insecticide standards for comparison with the seed treatment insecticide entries. All granular treatments were applied by using band (B) placement, which consisted of a 5-inch swath of granules applied to each row through Gandy™ row banders. Granular output rates were regulated by using planter-mounted Noble™ metering units that were calibrated on the planter before planting.

<u>Root injury ratings</u>: Root maggot feeding injury was assessed on 4 and 5 August. Ratings consisted of randomly collecting ten beet roots per plot (five from each of the outer two treated rows), 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).

<u>Harvest</u>: Treatment performance was also compared on the basis of sugarbeet yield parameters. Plots were harvested for yield assessments on 24 September. Immediately before harvest, the foliage was removed from all treatment plots by using a commercial-grade mechanical defoliator. After defoliation, all beets from the center two rows of each plot were extracted from soil by 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.

<u>Data analysis</u>: All data from root injury ratings and harvest samples 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:

Sugarbeet root maggot feeding injury results for this trial are presented in Table 1. Root injury ratings from the untreated check plots averaged 6.8 on the 0 to 9 scale of Campbell et al. (2000), suggesting that a relatively high SBRM infestation was present. The best root protection from root maggot feeding injury was provided by Counter 20G, and there was no statistical difference in root protection performance between the 7.5 and 8.9 lb product/ac application rates of this product. Neither of the Counter entries differed significantly in root maggot feeding injury from either the moderate (10 lb product/ac) or high (13.4 lb/ac) rate of Lorsban 15G; however, both application rates of Counter 20G were statistically superior to all seed treatment entries in this trial. Cruiser 5FS was the only seed treatment material that provided statistically significant reductions in SBRM feeding injury when compared to that of the untreated check plots.

Table 1. *Larval feeding injury* in a comparison of registered granular and seed treatment insecticides for sugarbeet root maggot control, St. Thomas, ND, 2014

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb a.i./ac)	Root injury (0-9)
Counter 20G	B	8.9 lb	1.8	4.00 e
Counter 20G	B	7.5 lb	1.5	4.23 e
Lorsban 15G	B	10 lb	1.5	4.93 de
Lorsban 15G	B	13.4 lb	2.0	5.00 cde
Cruiser 5FS	Seed		60 g a.i./ unit seed	5.63 bcd
NipsIt Inside	Seed		60 g a.i./ unit seed	5.98 abc
Poncho Beta	Seed		68 g a.i./ unit seed	6.23 ab
Check	---	----	---	6.80 a
LSD (0.05)				1.00

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

Yield, percent sucrose content, and gross economic return results from this trial are presented in Table 2. Plots treated with a planting-time application of Lorsban 15G at its high (13.4 lb product/ac) rate produced the highest recoverable sucrose yield and root tonnage in this study, and also had the highest root sucrose content. As a result, those plots generated the greatest gross economic return. However, it should be noted that plots treated with the moderate (7.5 lb product/ac) rate of Counter 20G generated exactly the same amount of gross revenue as those treated with Counter at the high (8.9 lb/ac) rate, which was $135 greater than that recorded for the untreated check plots. These two entries were the only insecticide treatments that were statistically greater in recoverable sucrose yield than the untreated check, although there were no statistically significant differences in recoverable sucrose yield between any of the granular (i.e., Counter 20G and Lorsban 15G) treatments in this study.

Table 2. *Yield parameters* from a comparison of registered granular and seed treatment insecticides for sugarbeet root maggot control, St. Thomas, ND, 2014

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb a.i./ac)	Sucrose yield (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Lorsban 15G	B	13.4 lb	2.0	6483 a	23.1 a	15.28 a	589
Counter 20G	B	7.5 lb	1.5	6426 a	22.8 ab	15.10 a	589
Counter 20G	B	8.9 lb	1.8	6078 ab	22.0 abc	14.90 a	534
Lorsban 15G	B	10 lb	1.5	5696 abc	20.6 bc	15.03 a	503
Check	---	----	---	5567 bcd	20.9 abc	14.60 a	454
Cruiser 5FS	Seed		60 g a.i./ unit seed	5272 cd	20.0 c	14.38 a	423
Poncho Beta	Seed		68 g a.i./ unit seed	4794 de	17.4 d	15.03 a	419
NipsIt Inside	Seed		60 g a.i./ unit seed	4334 e	16.3 d	14.43 a	351
LSD (0.05)				799	2.4	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

Yield results from the insecticidal seed treatment entries suggested that there was no significant benefit from any of these materials. The use of these materials as stand-alone treatments in this trial was only carried out for comparative purposes to measure the level of suppression or control they may be capable of providing. It is recommended by NDSU Extension that growers and pest managers plan on the use of additive control tools such as postemergence insecticide applications for successful SBRM control in high-risk areas.

References Cited:

Campbell, L. G., J. D. Eide, L. J. Smith, and G. A. Smith. 2000. Control of the sugarbeet root maggot with the fungus *Metarhizium anisopliae*. J. Sugar Beet Res. 37: 57–69.

SAS Institute. 2008. The SAS System for Windows. Version 9.2. SAS Institute Inc., 2002-2008. Cary, NC.