LIQUID INSECTICIDE ALTERNATIVES TO MANAGE SUGARBEET ROOT MAGGOT

Mark A. Boetel, Associate Professor
Robert J. Dregseth and Allen J. Schroeder, Research Specialists

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

Introduction:

Chemical control remains as the most reliable strategy for protection of sugarbeet from the feeding injury, yield reductions, and associated revenue losses that can result from infestations of the sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder). Planting-time soil insecticides have been relied upon heavily by many growers for root maggot control in the Red River Valley (RRV). Postemergence insecticide applications are also frequently needed in the more heavily infested areas of the growing area. The inclusion of insecticide granule hoppers and associated delivery equipment for planting-time applications can be a very expensive option on a new sugarbeet planter. However, after-market equipment to apply granular or liquid insecticides at planting time can, in some cases, be a more affordable option.

The recent federal registration of seed treatment insecticides for use in sugarbeet has precipitated a significant amount of enthusiasm among growers because seed treatments are considered more convenient to apply than planting-time granular materials. Seed treatment materials are also of interest because they allow growers to apply planting-time insecticide protection without the expenses of the planter-mounted application equipment and the inconveniences of transporting, storing, handling, and loading granular containers. NDSU research has led to the conclusion and recommendation that seed treatment insecticides are not likely to provide sufficient control of moderately high to severe root maggot infestations. This experiment was designed to compare the following materials with Counter 15G for SBRM control: 1) F6551 2EC, HGW86 20SC, and Lorsban 75WG as planting-time tools; and 2) Lorsban 75WG as a postemergence rescue application.

Materials and Methods:

This experiment was established on 21 May near St. Thomas, ND. The experiment was arranged in a randomized complete block design with four replications of the treatments. Each plot was 35 feet long, and 25-foot tilled alleys were maintained between replicates throughout the growing season. The registered standard insecticide used in the study for comparative purposes was Counter 15G. It was applied at 10 and 11.9 lb product/ac in a band (B) and also as a spoon-applied (S) application at 10 lb product/ac. Banded applications consisted of 5-inch swaths of granules that were achieved by using Gandy™ row banders. The spoon consists of a galvanized metal spoon shaped device that is attached at the terminal end of each planter-mounted in-furrow. A number 10 steel bolt is inserted in the center of the spoon near its terminal end. The bolt is fastened to the spoon with two hexagonal nuts. The nuts deflect insecticide granules coming down the tube to either side of the seed furrow, and thereby minimize the amount of insecticide deposited into the furrow. Liquid insecticides were applied using a Raven™ spray system mounted on a John Deere 71 Flex planter. The system was calibrated to deliver a spray volume of 5 GPA through TeeJet 8001E nozzles that were positioned at a height to achieve a 5-inch T-band.

Lorsban 75WG was applied as a broadcast application by using a tractor-mounted CO_2 spray system that delivered a finish spray volume of 10 GPA using TeeJet 11001VS nozzles. Plots that received postemergence liquid insecticides were established in the center tractor pass of a 3 tractor-pass zone to avoid edge effects of one treatment on another.

Root injury: Root maggot feeding injury was assessed on 7 August by 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). Treatment performance was also compared on the basis of sugarbeet yield parameters.

Harvest: On 17 September, all foliage was removed from plots immediately before harvest by using a commercial-grade mechanical defoliator. Shortly thereafter, all beets from the center 2 rows of each plot were lifted 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 analysis of sugar content and quality.

Data analysis: 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, 1999), 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 means from this trial are presented in Table 1. As evidenced by the average rating of 4.35 on the 0 to 9 scale, the larval feeding injury in this study was considered moderate. All insecticides except HGW86 20SC resulted in significantly less root maggot feeding injury than that observed in the untreated check plots; however, Counter 15G provided better root protection than all planting-time and postemergence liquid insecticide treatments in the experiment.

Table 1. *Larval feeding injury* in evaluation of liquid insecticide alternatives for sugarbeet root maggot control, St. Thomas, ND, 2008

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb a.i./ac)	Root injury (0-9)
Counter 15G	S	10 lb	1.5	1.85 d
Counter 15G	B	11.9 lb	1.8	1.85 d
Counter 15G	B	10 lb	1.5	2.10 d
-----	-----	-----	-----	
Lorsban 75WG	4 d pre-peak Broadcast	1.33		2.85 c
F6551 2EC	5" TB	38.4 fl oz		3.05 c
Lorsban 75WG	5" TB	1.33		3.05 c
Lorsban 75WG	5" TB	0.89		3.30 bc
-----	-----	-----	-----	
Lorsban 75WG	4 d pre-peak Broadcast	0.67		3.33 bc
HGW86 20SC	5" TB		0.13	3.95 ab
Check	-----	----	-----	4.35 a
LSD (0.05)				0.72

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; TB = T-band over open seed furrow

Significant differences in yield were less frequent than those observed in assessments of root injury. There were no statistical differences in recoverable sucrose or root yields among Counter 15G entries in this experiment. Counter 15G, applied at 11.9 lb in a band, produced the highest recoverable sucrose yield in the study; however, it was not statistically superior in sucrose yield to the following treatments: Counter 15G at 10 lb/ac (spoon-applied or banded): postemergence Lorsban 75WG (broadcast at 0.67 lb product/ac); planting-time Lorsban 75WG (1.33 lb, 5-inch T-band); and F6551 2EC. With regard to sugarbeet root yield, the only treatments outperformed by the top two Counter 15G entries (11.9 lb banded and 10 lb spoon) were HGW86 and Lorsban 75WG T-banded at the low (0.67 lb) rate. HGW86 was the only entry in the experiment that did not at least provide yield benefits that were comparable to Counter 15G banded at 10 lb product/ac.

Table 2. *Yield parameters* from evaluation of liquid insecticide alternatives for sugarbeet root maggot control, St. Thomas, ND, 2008

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 15G	B	11.9 lb	1.8	6116 a	21.8 ab	15.33 a	706
Counter 15G	S	10 lb	1.5	6066 a	22.6 a	14.73 a	664
----- Lorsban 75WG	----- 4 d pre-peak Broadcast	----- 0.67	-----	5652 ab	20.6 abc	15.03 a	636
F6551 2EC	5" TB	38.4 fl oz		5633 ab	20.7 abc	14.95 a	629
Lorsban 75WG	5" TB	1.33		5604 ab	20.1 bcd	15.25 a	644
Counter 15G	B	10 lb	1.5	5539 ab	20.6 abc	14.78 a	608
----- Lorsban 75WG	----- 4 d pre-peak Broadcast	----- 1.33	-----	5162 bc	20.4 bc	14.18 a	523
Lorsban 75WG	5" TB	0.89		5135 bc	18.8 cde	15.03 a	575
HGW86 20SC	5" TB		0.13	4775 c	18.1 de	14.55 a	510
Check	-----	----	-----	4696 c	17.5 e	14.73 a	514
LSD (0.05)				670	2.2	NS	

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; TB = T-band over open seed furrow

The results of this experiment are encouraging. Lorsban 75WG and F6551 appear to have good potential for possible incorporation into SBRM control programs in the future. It should be noted that the postemergence Lorsban 75WG entries in this experiment were established as stand-alone treatments. This scenario would not be recommended for SBRM management. The fact that Lorsban 75WG provided significant reductions in root maggot feeding injury and yield increases as a postemergence treatment, without any additive insecticide, suggests that it may have strong potential as a postemergence tool for SBRM control.

References Cited:

Boetel, M. A., R. J. Dregseth, A. J. Schroeder, and C. D. Doetkott. 2006. Conventional and alternative placement of soil insecticides to control sugarbeet root maggot (Diptera: Ulidiidae) larvae. J. Sugar Beet Res. 43: 47–63.

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. 1999. SAS/STAT user's guide for personal computers, version 8.0. SAS Institute, Inc., Cary, NC.