COMPARISONS OF SOIL INSECTICIDE RATES AND PLACEMENT METHODS FOR SUGARBEET ROOT MAGGOT CONTROL

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

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

Larry J. Smith, Superintendent

Northwest Research & Outreach Center, University of Minnesota, Crookston, MN

Introduction:

The sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder), is a major economic pest of sugarbeet in the Red River Valley of Minnesota and North Dakota. This ongoing project is aimed at evaluating the performance of registered insecticides applied at planting time at varying rates and using different placement methods for controlling the sugarbeet root maggot. Data collected is often used to form or adjust extension recommendations and assist growers with SBRM management on their farms.

Methods and Materials:

This experiment was conducted in a commercial sugarbeet field near St. Thomas, ND and at a second location on the University of Minnesota's Northwest Research and Outreach Center near Crookston, MN. The St. Thomas site was planted on April 29, and the variety used was Beta 6600. The Crookston trial was planted on May 18 using Beta 3820 seed. Treatments included in the trials were planting-time applications of Counter 15G (7, 10, 11.9 lb product/acre) and Lorsban 15G at rates of 6.7, 10, 13.4 lb product/acre. Placement methods tested included modified in-furrow (M), band (B), and spoon (S). The experiment was arranged in a randomized complete block design with four replications. A 6-row John Deere 71 Flex planter was used to establish the plots, with the four center rows being treated and the outside row on each end used as an untreated buffer row. Insecticide treatments were applied using Noble metering units. Banded treatments were applied in a 5-inch swath over the row using Gandy™ row banders. Modified in-furrow placement was achieved by dropping the insecticide down a conventional in-furrow tube over the row just in-front of the rear press wheel so that some soil covered the seed. The spoon is a galvanized metal spoon-like apparatus with flanges on the outside edge to direct the granules in a miniature band over the row. A steel bolt (no. 10 size) was inserted at the center of the spoon near its tip with two metal hex-shaped nuts attached to the bolt to deflect most insecticide granules laterally to fall immediately outside the edge of the furrow.

To compare the treatments for root protection capabilities, ten beets (five from each of the outer two treated rows) were collected from each plot and rated in accordance with the 0 to 9 root injury scale of Campbell et al. (2000). The inner two rows of each plot were harvested on September 28 to evaluate the yield impacts of the treatments. Immediately before harvest, foliage was removed from the plants by using a commercial-grade mechanical defoliator. Plots were then harvested using a modified two-row sugarbeet harvester. A subsample of about 12-16 beets was collected from each plot and sent to the American Crystal Company Quality Tare Laboratory (East Grand Forks, MN) for analysis of sugar content and quality. All data collected were subjected to analysis of variance (ANOVA) and means were separated using the Fisher protected least significant difference (LSD) test at a 0.05 level of significance for treatment effects on root injury, yield, and percent sucrose.

Results and Discussion:

St. Thomas. Root injury results from this trial are presented in Table 1 and yield comparisons are listed in Table 2. The general trend (in both root damage and yield parameters) was that modified in-furrow and spoon placement provided the best root maggot control. This was especially the case with Counter 15G. At the high (11.9 lb product/acre) rate of Counter, modified in-furrow and spoon applications resulted in significantly lower root maggot feeding injury than banded applications. Plots treated with the spoon application of Counter at the 11.9-lb rate also yielded statistically more recoverable sucrose than those treated with Counter in a band application. The

spoon application in this comparison generated an increase of 879 lb in recoverable sucrose and $107 in additional revenue per acre. When banded placement was used, reducing the rate from the full labeled rates (11.9 lb and 13.4 for Counter and Lorsban, respectively) to lower (7 lb for Counter and 6.7 lb for Lorsban) did not result in a significant loss in root damage protection or yield (sucrose/ac or root yield). Similarly, no rate response in root damage, sucrose yield, or tonnage yield was observed between high (11.9 lb), moderate (10 lb), and low (7 lb) rates of Counter 15G when it was applied modified in-furrow. Reducing planting-time insecticide rates and reserving the use of postemergence applications for when populations warrant them could potentially save growers substantial amounts in insecticide costs when postemergence treatments are not needed because of low fly activity levels.

In considering the findings from the St. Thomas trial, our recommendation would be that growers avoid using the lower (6.7 and 7 lb) application rates of these materials at planting for SBRM control in heavily infested areas of the Valley until further research can be conducted. The 10-lb rate of Counter or Lorsban will provide adequate protection in many cases; however, in previous years, maggot populations often overcame this rate. Growers that choose to apply 10 lb of either Counter 15G or Lorsban 15G at planting may achieve acceptable control, but should expect that curative postemergence treatments will usually be needed in such fields if located in a high-risk area (i.e., northeastern ND) for maggot damage. One fairly consistent finding from this research during the past several years has been that spoon placement appears to be a crop-safe and effective method for applying both Counter and Lorsban to control the sugarbeet root maggot.

Table 1. Effect of rate and placement method on registered insecticide performance in preventing sugarbeet root maggot *feeding injury*, St. Thomas, ND, 2004.

Treatment/form.	Placement	Rate (lb product/ac)	Rate (lb ai/ac)	Root injury (0-9)
Lorsban 15G	S	13.4	2.0	6.33 f
Counter 15G	M	11.9	1.8	6.63 ef
Counter 15G	M	10	1.5	6.70 def
Counter 15G	S	11.9	1.8	6.70 def
Lorsban 15G	B	13.4	2.0	6.75 def
Lorsban 15G	S	10	1.5	6.85 cde
Counter 15G	M	7	1.05	6.85 cde
Lorsban 15G	B	10	1.5	6.95 b-d
Lorsban 15G	B	6.7	1.0	7.00 b-d
Counter 15G	S	10	1.5	7.03 b-d
Lorsban 15G	S	6.7	1.0	7.10 b-d
Counter 15G	B	10	1.5	7.15 bcd
Counter 15G	S	7	1.05	7.28 bc
Counter 15G	B	11.9	1.8	7.28 bc
Counter 15G	B	7	1.05	7.43 ab
Check	-	-	-	7.93 a
LSD (0.05)				0.52

Table 2. Effect of rate and placement method on *yield parameters* in plots treated with registered insecticides to control sugarbeet root maggot larvae, St. Thomas, ND, 2004.

Treatment/form.	Placement	Rate (lb product/ac)	Rate (lb ai/ac)	Recoverable sucrose (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Lorsban 15G	S	13.4	2.0	5333 a	18.1 a	15.78 ab	573
Lorsban 15G	S	10	1.5	5164 ab	16.9 ab	16.13 a	573
Lorsban 15G	B	13.4	2.0	4888 abc	16.6 ab	15.7 ab	523
Lorsban 15G	B	10	1.5	4617 a-d	16.0 abc	15.38 bcd	482
Counter 15G	S	11.9	1.8	4617 a-d	15.6 bcd	15.83 ab	497
Counter 15G	S	10	1.5	4578 a-d	15.5 bcd	15.68 ab	490
Counter 15G	M	11.9	1.8	4516 b-e	15.5 bcd	15.50 abc	477
Counter 15G	M	10	1.5	4417 b-f	15.0 c-e	15.63 ab	471
Lorsban 15G	S	6.7	1.0	4287 c-g	14.9 b-e	15.40 bcd	447
Counter 15G	M	7	1.05	4230 c-g	14.6 b-e	15.48 bc	443
Counter 15G	S	7	1.05	4007 d-g	13.7 cde	15.58 abc	425
Lorsban 15G	B	6.7	1.0	3893 d-g	13.3 de	15.53 abc	412
Counter 15G	B	11.9	1.8	3738 efg	13.0 ef	15.35 bcd	390
Counter 15G	B	10	1.5	3710 fg	13.3 de	14.98 cd	374
Counter 15G	B	7	1.05	3546 gh	12.8 ef	14.83 d	354
Check	-	-	-	2804 h	10.8 f	14.00 e	255
LSD (0.05)				801	2.9	0.65	

Crookston. Damage rating data from Crookston (Table 3) illustrate the fact that root maggot infestations at this site were very light during the 2004 growing season. As a result, very few differences were observed among treatments. The only entry that had significantly less larval feeding injury than the untreated check at this site was Counter 15G at 10 lb product/acre modified in-furrow.

Table 3. Performance of registered insecticides in managing the sugarbeet root maggot, Crookston, MN, 2004.

Treatment/form.	Placement	Rate (lb product/ac)	Rate (lb ai/ac)	Root injury (0-9)
Counter 15G	M	10	1.5	1.33 d
Lorsban 15G	S	6.7	1.0	1.53 cd
Counter 15G	S	7	1.05	1.55 bcd
Counter 15G	B	7	1.05	1.68 a-d
Lorsban 15G	B	13.4	2.0	1.73 a-d
Lorsban 15G	S	13.4	2.0	1.80 a-d
Counter 15G	S	10	1.5	1.83 a-d
Counter 15G	B	10	1.5	1.83 a-d
Lorsban 15G	B	6.7	1.5	1.83 a-d
Lorsban 15G	B	10	1.0	1.83 a-d
Lorsban 15G	S	10	1.5	1.88 abc
Counter 15G	M	11.9	1.8	1.93 abc
Check	-	-	-	1.95 abc
Counter 15G	B	11.9	1.8	2.05 ab
Counter 15G	S	11.9	1.8	2.08 a
Counter 15G	M	7	1.05	2.10 a
LSD (0.05)				0.52

Yield data from Crookston (Table 4) require careful consideration because of the low SBRM infestation that occurred there in 2004. The only treatments that did not provide a significant increase in recoverable sucrose yield at Crookston were the spoon application of Lorsban 15G at the high (13.4 lb product/acre) rate and Counter 15G modified in-furrow at both 7 and 11.9 lb/acre. Interestingly, a slight trend was evident in that recoverable sucrose and root yield tended to decrease with increasing rates of Counter 15G and, to a lesser extent, Lorsban. These findings suggest that growers in areas projected to have low SBRM infestations (refer to Sugarbeet Production Guide for current year's forecast) should consider a lower application rate of these materials due to the potential for slight yield reductions in the absence of significant SBRM feeding pressure.

Table 4. Performance of registered insecticides in managing sugarbeet root maggot, Crookston, MN, 2004.

Treatment/form.	Placement	Rate (lb product/ac)	Rate (lb ai/ac)	Recoverable sucrose (lb/ac)	Root yield (T/ac)	Sucrose (%)
Counter 15G	S	7	1.05	6190 a	19.4 a-d	16.9 a
Counter 15G	B	7	1.05	6163 ab	19.6 ab	16.8 ab
Counter 15G	B	10	1.5	6086 ab	19.5 abc	16.6 ab
Counter 15G	S	10	1.5	5993 abc	19.7 a	16.3 abc
Counter 15G	B	11.9	1.8	5936 a-d	19.2 a-e	16.5 ab
Counter 15G	S	11.9	1.8	5773 a-e	18.7 a-f	16.5 ab
Lorsban 15G	B	13.4	2.0	5704 b-f	18.5 b-g	16.4 abc
Lorsban 15G	B	6.7	1.0	5595 c-g	18.3 e-g	16.3 abc
Lorsban 15G	S	6.7	1.0	5577 c-g	18.1 efg	16.4 abc
Lorsban 15G	S	10	1.5	5571 c-g	18.1 efg	16.4 abc
Lorsban 15G	B	10	1.5	5539 c-g	18.4 c-g	16.1 bc
Counter 15G	M	10	1.5	5488 d-g	17.9 fgh	16.5 abc
Counter 15G	M	7	1.05	5412 e-h	18.0 fgh	16.1 bc
Counter 15G	M	11.9	1.8	5270 fgh	16.9 hi	16.6 ab
Lorsban 15G	S	13.4	2.0	5119 gh	17.5 gh	15.7 c
Check	-	-	-	4995 h	16.1 i	16.6 ab
LSD (0.05)				479	1.1	0.78

Reference 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. Sugarbeet Res. 37: 57–69.