DO REPLANTED SUGARBEET FIELDS NEED ADDITIONAL INSECTICIDE PROTECTION TO PREVENT SUGARBEET ROOT MAGGOT INJURY?

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

Department of Entomology
North Dakota State University
Fargo, ND

Introduction:

Sugarbeet fields occasionally require replanting due to a variety of factors. Frost damage and mechanical injury to seedlings from high winds are two of the most common causes. Replanting sugarbeet is an expensive operation because of the costs of seed, fuel, wear-and-tear on equipment, and labor time. In addition, later-or replanted fields tend to yield less than those planted at a more normal timing. Replanted sugarbeet plants are also smaller and much more vulnerable to attack by larvae of the sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder). This experiment was carried out to answer the following questions:

1) Do replanted sugarbeet fields need additional insecticide protection to prevent economic losses caused by the sugarbeet root maggot?
2) If so, will a second planting-time insecticide achieve acceptable control?
3) If an insecticide was not applied at replanting, will a postemergence rescue treatment provide adequate control?

Materials and Methods:

The plots were established on April 28, 2004 near St. Thomas, ND. The seed variety used was Crystal 822. The experiment was arranged in a randomized block design with four replications of the treatments. Each plot was 35 feet long with a 25-foot tilled alleys between plots. To simulate a replanting situation for all plots in this experiment, no seed was applied when the plots were initially established. Plots that received a planting-time insecticide were established in the same manner they would have been if actually planting except no seed was being dispensed at the time. Planting-time insecticides used were Counter 15G and Lorsban 15G, and each was applied at its high label rate (11.9 and 13.4 lb product/ac, respectively) during the simulated early planting operation. Counter was applied modified in-furrow (M) and Lorsban 15G was applied in a band (B). Modified in-furrow placement involved dropping granules down a tube over the row but directing them back away from the seed drop zone and in front of the rear press wheel. This allowed some soil to cover the seed before granules entered the furrow so as to avoid direct insecticide/seed contact. Banded applications consisted of 5-inch swaths of granules that were achieved by using Gandy™ row banders.

The actual planting for this experiment was done on May 18 to simulate a typical date for replanting in the region. Plots receiving a granular insecticide (Counter 15G or Lorsban 15G) at replanting were all treated at a moderate rate of 10 lb product/acre. Counter was applied at replanting to plots that had been initially treated with Lorsban 15G, and plots established with Counter 15G at the simulated first planting were treated at replanting with Lorsban granules. This was done to comply with label requirements because each of these products are restricted to one application per year for a given field.

Also at replanting, Lorsban 4E was applied in an experimental "V-band" placement by using TeeJet (TJ-60 twin even flat fan) 4002-EVS nozzles. The material was applied in a side-dress manner by directing each of two spray streams to the immediate outside edge of the seed furrow. The intent of using a V-band was to test the safety and efficacy of applying Lorsban 4E at planting. **It should be noted that this application is currently experimental and, as such, should not be used in commercially grown sugarbeet until fully tested.** The resulting application was a 1-inch band of Lorsban 4E applied to each side of the furrow from a single nozzle.

The use of postemergence liquid insecticides was also tested as a possible option for protecting replanted fields. Postemergence insecticides tested (Lorsban 4E and Vydate C-LV) were applied in 7-inch bands over the row to plots that had been established as early-planted Counter 15G or Lorsban 15G (at a rate of 10 lb product/ac) at the early treating of April 28. The other postemergence insecticide used was Vydate C-LV at 34 fl oz product/ac in a 7-inch band applied over the top of the early treatment of Counter 15G (at a rate of 10 lb product/ac). These treatments were applied prior to peak SBRM adult activity on June 21. The postemergence insecticide was applied using a tool bar mounted CO_2 spray system delivering 10 GPA through TeeJet 6501E nozzles. This was applied to the four center rows the same as was done at planting.

Root maggot feeding injury was assessed in this experiment on August 11, 12, and 16 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 damage rating scale (0 = no scarring, and 9 = over ¾ of the root surface blackened by scarring or dead beet) of Campbell et al. (2000).

Performance was also compared on the basis of sugarbeet yield parameters. Harvest was carried out on September 28. Foliage was removed from all plots immediately before harvest by using a commercial-grade mechanical defoliator. 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 12-16 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. All data from damage rating 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:

Root injury results from this study demonstrate that applying a second insecticide during sugarbeet replanting significantly reduced feeding injury caused by SBRM larvae (Table 1). Major benefits in recoverable sucrose, and root yields were also observed by using a second insecticide (Table 2). Results also showed that supplementing the initial planting-time application of Lorsban (high labeled rate) with a replanted application of Counter 15G at only 10 lb product/ac resulted in a root yield increase of 5.2 tons over not applying an insecticide at replanting. The increase in gross economic return from the applying Counter at replanting in this scenario was $217/acre. Similarly, initial seeding with Counter 15G at the high labeled rate (11.9 lb product) followed by Lorsban 15G (10 lb) at re-seeding produced 5.3 tons more root yield, and the economic benefit averaged $198/acre.

Deferring the second insecticide application until postemergence of the crop (near peak fly) also produced significant benefits over not applying a second insecticide application, and produced an increase in gross economic return by $199 per acre. Postemergence Vydate resulted in lower root injury, however, yield benefits from this application were not statistically detectable. Insecticide applications in a replant situation require careful consideration because two of the most common soil insecticides applied at planting time for root maggot management, Counter 15G and Lorsban 15G, are only allowed to be used once per growing season in a given field. This study needs to be repeated to confirm these preliminary findings.

Table 1. Sugarbeet root maggot *feeding injury* in replanted sugarbeet, St. Thomas, ND, 2004.

Treatment/form.	Placement	Rate (product/ac)	Rate (lb ai/ac)	Root injury (0-9)
Counter 15G + --- Vydate 3.77 SL	M --- 7" Band	11.9 lb --- 34 fl oz	1.8 --- 1.0	3.85 e
Counter 15G + Lorsban 15G at replant	M B	11.9 lb 10 lb	1.8 1.5	4.05 e
Counter 15G + --- Lorsban 4E	M --- 7" Band	11.9 lb --- 1.0 pt	1.8 --- 0.5	4.38 de
Lorsban 15G + --- Lorsban 4E	B --- 7" Band	13.4 lb --- 1.0 pt	2.0 --- 0.5	4.48 de
Lorsban 15G + Counter 15G at replant	B B	13.4 lb 10 lb	2.0 1.5	4.65 de
---- Lorsban 4E at replant	--- V-band	--- 2.0 pt	--- 1.0	5.30 cd
Lorsban 15G	B ---	13.4 lb ---	2.0 ---	6.13 bc
Counter 15G	M ---	11.9 lb ---	1.8 ---	6.45 b
----- Lorsban 4E at replant	--- V-band	--- 1.0 pt	--- 0.5	6.65 b
Untreated check	----	----	----	7.80 a
LSD (0.05)				0.94

Table 2. *Yield impacts* from sugarbeet root maggot feeding injury in replanted sugarbeet plots, St. Thomas, ND, 2004.

Treatment/form.	Placement	Rate (product/ac)	Rate (lb ai/ac)	Recoverable sucrose (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Lorsban 15G + Counter 15G at replant	B B	13.4 lb 10 lb	2.0 1.5	5341 a	17.8 a	16.13 a	581
Counter 15G + Lorsban 15G at replant	M B	11.9 lb 10 lb	1.8 1.5	5323 a	17.9 a	15.93 ab	574
Counter 15G + --- Lorsban 4E Post	M --- 7" Band	11.9 lb --- 1.0 pt	1.8 --- 0.5	5098 ab	17.0 a	16.13 a	556
Lorsban 15G + --- Lorsban 4E Post	B --- 7" Band	13.4 lb --- 1.0 pt	2.0 --- 0.5	4998 ab	16.6 ab	16.10 a	546
Counter 15G + --- Vydate 3.77 SL Post	M --- 7" Band	11.9 lb --- 34 fl oz	1.8 --- 1.0	4233 bc	14.0 bc	16.08 ab	465
----- Lorsban 4E at replant	--- V-band	--- 2.0 pt	--- 1.0	4093 c	13.9 bc	15.78 ab	438
Lorsban 15G + -----	B ---	13.4 lb ---	2.0 ---	3653 c	12.6 cd	15.43 bc	383
Counter 15G + ---	M ---	11.9 lb ---	1.8 ---	3529 c	12.6 cd	14.88 cd	357
----- Lorsban 4E at replant	--- V-band	--- 1.0 pt	--- 0.5	3438 cd	12.4 cd	15.00 cd	342
Untreated check	----	----	----	2623 d	9.8 d	14.55 d	250
LSD (0.05)				898	2.9	0.65	

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. Sugarbeet Res. 37: 57–69.

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