IMPACTS OF TIMING AND RATE ON PERFORMANCE OF THIMET 20G FOR POSTEMERGENCE CONTROL OF SUGARBEET ROOT MAGGOT

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Introduction:

In recent years, alternative tools such as insecticidal seed treatments and liquid insecticide products have been introduced for control of the sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder). However, concurrent with relatively wide adoption of these tools by Red River Valley sugarbeet growers has been a somewhat steady increase in the severity and geographic distribution of SBRM infestations in the growing region. This has prompted the need for additional research on optimization of postemergence tools for more effective SBRM management. The key objective of this experiment was to assess the impacts of application timing and rate on the performance of Thimet 20G insecticide when applied as a postemergence rescue insecticide for SBRM control in the Red River Valley growing area. A secondary objective was to compare moderate and high rates of Counter 20G (i.e., 7.5 and 8.9 lb product/acre, respectively) as planting-time tools in dual-insecticide (i.e., planting-time + postemergence) regimes for root maggot control.

Materials and Methods:

This study was planted on 29 May at a field site near St. Thomas (Pembina County), ND. Plots were planted using a 6-row John Deere ™ 71 Flex planter set to plant at a depth of 1¼ inch and a rate of one seed every 4½ inches of row length. Plots were 6 rows (22-inch spacing) wide with the 4 centermost rows treated. The outer row on each side 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. Counter 20G was used as a base planting-time insecticide for all plots that received insecticide protection, and it was applied at either the moderate (7.5 lb product/ac) or high (8.9 lb/ac) labeled rate. Granular output rates were regulated by using planter-mounted Noble™ metering units that were calibrated on the planter before planting. Placement of granules in 5-inch bands over the rows during planting was achieved by using Gandy™ row banders.

Postemergence Thimet 20G granules were applied at either 17 or 11 days before peak fly activity (i.e., 6 or 12 June), and rates of Thimet 20G included 4.9 and 7 lb product/ac. Granular output rates were regulated by using Noble™ metering units, and placement of insecticide in 4-inch bands was achieved by using Kinze™ row banders attached to a tractor-mounted tool bar. Granules were incorporated by using two pairs of rotary tines that straddled each row. A paired set of tines was positioned ahead of each bander, and a second pair was mounted behind the granular drop zone.

Lorsban Advanced, applied in a broadcast at 1 pt product/ac using TeeJet™ 110015VS nozzles, was also included in this experiment for comparative purposes. This application was made on 17 June, which was six days before peak SBRM fly activity. To avoid confounding effects from neighboring treatments that did not receive a treatment capable of killing SBRM flies, plots treated with Lorsban Advanced were three tractor passes wide rather than the standard single pass. However, only the inner six rows of the plot were sprayed, and all treatment assessments were made in the inner four rows of the sprayed zone of each plot.

Root injury ratings: Root maggot feeding injury was assessed on 5 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).

Harvest: Performance was also compared using sugarbeet yield parameters derived by harvesting roots from all treatment plots. All foliage was removed from plots immediately before harvest on 24 September by using

a commercial-grade mechanical defoliator. On the same day, 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.

Data analysis: All data from root injury ratings and yield/quality analyses were subjected to analysis of variance (ANOVA) using the general linear models (GLM) procedure (SAS Institute, 2008). Treatment means were separated using Fisher's protected least significant difference (LSD) test at a 0.05 level of significance.

Results and Discussion:

Results from root maggot feeding injury assessments for this trial are presented in Table 1. Dual-application (planting-time plus postemergence) insecticide programs that included postemergence Thimet 20G applications provided numerical improvements in root protection from SBRM feeding injury over those that involved either postemergence Lorsban Advanced or simply a single, planting-time application of Counter 20G. However, all insecticide regimes in the experiment, whether consisting of a single planting-time treatment or a dual-insecticide program, provided significant reductions in SBRM feeding injury when compared to the untreated check. There was no significant difference between the 7.5- and 8.9-lb product/ac planting-time-only applications of Counter 20G with regard to protection from SBRM feeding injury. The postemergence spray of Lorsban Advanced at its moderate labeled rate (1 pt product/ac) failed to provide a significant improvement in root protection when added to plots initially treated with the 7.5-lb rate of Counter 20G at planting.

Trends suggested that the earlier (17 days pre-peak) application timing of postemergence Thimet applications tended to perform slightly better than later (11 days pre-peak), although there was no statistically significant impact of Thimet application timing on root protection from SBRM feeding injury. In plots initially treated at planting with the moderate (7.5 lb product/ac) rate of Counter 20G, the addition of Thimet 20G at postemergence consistently resulted in significant reductions in SBRM feeding injury, irrespective of which rate of Thimet was used or whether it was applied at 11 or 17 days before peak fly activity.

Table 1. *Larval feeding injury* in an evaluation of Thimet 20G application timing and rate on 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 + Thimet 20G	B 11 d Pre-peak Post B	8.9 lb 7 lb	1.8 1.4	2.85 d
Counter 20G + Thimet 20G	B 17 d Pre-peak Post B	7.5 lb 4.9 lb	1.5 1.0	2.88 d
Counter 20G + Thimet 20G	B 17 d Pre-peak Post B	8.9 lb 7 lb	1.8 1.4	2.93 d
Counter 20G + Thimet 20G	B 17 d Pre-peak Post B	7.5 lb 7 lb	1.5 1.4	2.93 d
Counter 20G + Thimet 20G	B 11 d Pre-peak Post B	7.5 lb 4.9 lb	1.5 1.0	3.03 cd
Counter 20G + Thimet 20G	B 11 d Pre-peak Post B	7.5 lb 7 lb	1.5 1.4	3.33 cd
Counter 20G	B	8.9 lb	1.8	3.40 cd
Counter 20G + Lorsban Advanced	B 6 d Pre-peak Broadcast	7.5 lb 1 pt	1.5 0.5	3.78 bc
Counter 20G	B	7.5 lb	1.5	4.23 b
Check	-----	----	-----	6.58 a
LSD (0.05)				0.80

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; Post B = postemergence band

Yield data from this experiment are presented in Table 2. All insecticide-treated entries in this trial resulted in significant increases in recoverable sucrose yield when compared to the untreated check. The top-performing treatment in this trial with regard to recoverable sucrose yield, root tonnage, and percent sucrose involved an at-plant application of Counter 20G at its moderate (7.5 lb product/ac) rate, combined with a postemergence application of Thimet 20G applied at the lower (4.9 lb product/ac) rate at 17 days before peak SBRM fly activity. Although this combination was not statistically superior to the same rates of this Counter/Thimet combination when it was applied at 11 days pre-peak, applying the Thimet 17 days pre-peak generated $113 more revenue per acre than when the combination involved the later application of Thimet. This combination, when Thimet was applied earlier, resulted in an overall increase of $365 in revenue over that of the untreated check plots. This finding clearly underscores the economic significance of the sugarbeet root maggot, and justifies the pursuit of effectively controlling it.

Table 2. Impacts of Thimet 20G application timing and rate on *yield parameters* in an evaluation of 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)
Counter 20G + Thimet 20G	B 17 d Pre-peak Post B	7.5 lb 4.9 lb	1.5 1.0	7378 a	25.3 a	15.63 a	714
Counter 20G + Thimet 20G	B 11 d Pre-peak Post B	7.5 lb 4.9 lb	1.5 1.0	6459 ab	22.7 ab	15.33 a	601
Counter 20G + Thimet 20G	B 17 d Pre-peak Post B	7.5 lb 7 lb	1.5 1.4	6352 ab	22.2 ab	15.48 a	597
Counter 20G + Lorsban Advanced	B 6 d Pre-peak Broadcast	7.5 lb 1 pt	1.5 0.5	6350 ab	22.3 ab	15.33 a	591
Counter 20G + Thimet 20G	B 17 d Pre-peak Post B	8.9 lb 7 lb	1.8 1.4	6333 ab	22.0 ab	15.40 a	601
Counter 20G + Thimet 20G	B 11 d Pre-peak Post B	8.9 lb 7 lb	1.8 1.4	6120 b	21.7 ab	15.23 a	562
Counter 20G + Thimet 20G	B 11 d Pre-peak Post B	7.5 lb 7 lb	1.5 1.4	5877 b	20.7 b	15.23 a	544
Counter 20G	B	8.9 lb	1.8	5764 b	20.1 bc	15.43 a	544
Counter 20G	B	7.5 lb	1.5	5619 b	19.9 bc	15.20 a	514
Check	-----	----	-----	4381 c	16.7 c	14.45 b	349
LSD (0.05)				1150	4.0	0.52	

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; Post B = postemergence band

As observed with root injury rating data, the yield results from this trial demonstrated that there was no significant benefit from using the high (8.9 lb) rate of Counter when compared to the 7.5-lb rate, irrespective of whether Counter was used as a stand-alone, planting-time-only treatment, or in combination with postemergence Thimet. This suggests that growers could potentially save some input cost in these programs by initially treating fields with the moderate rate (7.5 lb product/ac) of Counter, and following it with a postemergence application of Thimet 20G. Results from this trial also suggest that there was no significant yield benefit and no increase in revenue by using the high rate of postemergence Thimet. This suggests that additional input cost can be reduced by using the lower (4.9-lb) rate of Thimet at postemergence, which tended to optimize yield and revenue in this trial.

References Cited:

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