# DOES APPLICATION RATE OR TIMING IMPACT PERFORMANCE OF THIMET 20G FOR POSTEMERGENCE SUGARBEET ROOT MAGGOT CONTROL?

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## Introduction:

In recent years, sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder), populations have been at alarmingly high levels in central and northern portions of the Red River Valley. This has provided the impetus to refine 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. 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 components in dual-insecticide (i.e., planting-time + postemergence) programs for root maggot control.

## Materials and Methods:

This study was planted on 10 May at a commercial field site near St. Thomas (Pembina County), ND. Plots were planted using a 6-row Monosem NG Plus 7x7 planter set to plant at a depth of 1¼ inch and a rate of one seed every 4½ inches of row length. Plots were six rows (22-inch spacing) wide with the four centermost rows treated. The outer two rows of each plot served as untreated buffers. Individual plots were 35 feet long, and 35-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 applied 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. Band (B) placement (Boetel et al. 2006), which consisted of 5-inch swaths of granules delivered through Gandy™ row banders, was used for all applications of Counter 20G. Granular output rates were regulated by using a planter-mounted SmartBox™ computer-controlled insecticide system that was calibrated on the planter before planting.

Postemergence Thimet 20G granules were applied at either 11 or five days before peak fly activity (i.e., 31 May or 6 June, respectively), and rates of Thimet 20G included 4.9 and 7 lb product/ac. As with at-plant applications, granular output rates were regulated by using a SmartBox™ system mounted on a tractor-drawn four-row toolbar, and placement of insecticide in 4-inch bands was achieved by using Kinze™ row banders. Granules were incorporated by using two pairs of metal rotary tines that straddled each row. A 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 8 June, which was two days before the initial peak in SBRM fly activity.

Root injury ratings: Root maggot feeding injury assessments were carried out on 31 July 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 3 October 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:**

Root maggot feeding injury results from this trial are presented in Table 1. The SBRM infestation present for this experiment was classified as moderate, as was evidenced by the moderate average feeding injury rating of 5.2 (0 to 9 scale of Campbell et al. 2000) in the untreated check plots. Although all insecticide entries in the experiment provided significant reductions in SBRM feeding injury when compared to the untreated check, the moderate infestation resulted in very few statistically significant differences among insecticide treatments. Most of the dual (i.e., planting-time plus postemergence) insecticide programs that included a planting-time application of Counter 20G at its moderate rate of 7.5 lb product/ac rate, followed by a postemergence application of Thimet 20G provided significant improvements in root protection from SBRM feeding injury when compared to those that only received the single, 7.5-lb application of Counter at planting time. Exceptions to this were the 11-day pre-peak fly applications of Thimet that followed the moderate rate of Counter. When the full 8.9-lb rate of Counter was applied at planting, there were numerical reductions in SBRM feeding injury in plots that received a postemergence application of Thimet, but none of the differences were statistically significant. As observed in previous years of testing, there were no significant differences in root protection from SBRM feeding injury in relation to timing of the Thimet applications, regardless of the rate of the initial at-plant rate of Counter. There also was no significant application rate response in feeding injury ratings between the single, at-plant applications of 7.5 and 8.9 lb of Counter 20G, thus suggesting that the higher rate is probably not necessary in a dual-insecticide program under low to moderate SBRM pressure such as that which occurred during this trial.

**Table 1. *Larval feeding injury* in an evaluation of Thimet 20G application timing and rate on sugarbeet root maggot control, St. Thomas, ND, 2017**

| Treatment/form. | Placement[a] | Rate (product/ac) | Rate (lb a.i./ac) | Root injury (0-9) |
|---|---|---|---|---|
| Counter 20G + Thimet 20G | B 5 d Pre-peak Post B | 8.9 lb 7 lb | 1.8 1.4 | 1.13 c |
| Counter 20G + Thimet 20G | B 5 d Pre-peak Post B | 7.5 lb 4.9 lb | 1.5 1.0 | 1.20 c |
| Counter 20G + Thimet 20G | B 5 d Pre-peak Post B | 7.5 lb 7 lb | 1.5 1.4 | 1.20 c |
| Counter 20G + Thimet 20G | B 11 d Pre-peak Post B | 8.9 lb 7 lb | 1.8 1.4 | 1.20 c |
| Counter 20G + Thimet 20G | B 11 d Pre-peak Post B | 7.5 lb 7 lb | 1.5 1.4 | 1.48 bc |
| Counter 20G + Thimet 20G | B 11 d Pre-peak Post B | 7.5 lb 4.9 lb | 1.5 1.0 | 1.60 bc |
| Counter 20G | B | 8.9 lb | 1.8 | 1.90 bc |
| Counter 20G + Lorsban Advanced | B 3 d Pre-peak Broadcast | 7.5 lb 1 pt | 1.5 0.5 | 2.00 b |
| Counter 20G | B | 7.5 lb | 1.5 | 2.23 b |
| Check | ----- | ---- | ----- | 5.20 a |
| LSD (0.05) | | | | 0.785 |

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

The postemergence spray of Lorsban Advanced, applied at its moderate labeled rate (1 pt product/ac) did not provide a significant improvement in root protection when added to plots initially treated with the 7.5-lb rate of Counter 20G at planting. This result may have been caused by the hailstorm and associated heavy rainfall that occurred on June 9, which was just one day after the Lorsban Advanced was applied.

Yield data from this experiment are presented in Table 2. All insecticide-treated entries in this trial, except the single planting-time application of Counter 20G at its moderate rate (7.5 lb product/ac) of resulted in significant

increases in recoverable sucrose yields when compared to the untreated check. Plots treated with the combination of Counter 20G at its high (8.9 lb product/ac) rate plus a postemergence application of the high (7 lb/ac) rate of Thimet 20G at 11 days before peak fly generated the highest average recoverable sucrose and root yield in the trial. Roots harvested from that treatment also had the highest percentage sucrose content in the study; however, very few of the differences were statistically significant. There were no significant differences in recoverable sucrose, root tonnage, or percent sucrose between the single planting-time applications of Counter 20G. Similarly, there were no significant differences for any yield parameter between Thimet application rates or timings tested.

**Table 2. Impacts of Thimet 20G application timing and rate on *yield parameters* in an evaluation of sugarbeet root maggot control, St. Thomas, ND, 2017**

| 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 11 d Pre-peak Post B | 8.9 lb 7 lb | 1.8 1.4 | 11,179 a | 33.3 a | 17.73 a | 1,472 |
| Counter 20G + Thimet 20G | B 11 d Pre-peak Post B | 7.5 lb 4.9 lb | 1.5 1.0 | 10,689 ab | 32.6 a | 17.25 a | 1,367 |
| Counter 20G + Thimet 20G | B 5 d Pre-peak Post B | 8.9 lb 7 lb | 1.8 1.4 | 10,636 ab | 33.2 a | 16.93 a | 1,322 |
| Counter 20G + Lorsban Advanced | B 3 d Pre-peak Broadcast | 7.5 lb 1 pt | 1.5 0.5 | 10,595 ab | 32.7 a | 17.10 a | 1,337 |
| Counter 20G + Thimet 20G | B 5 d Pre-peak Post B | 7.5 lb 7 lb | 1.5 1.4 | 10,582 ab | 32.4 a | 17.30 a | 1,349 |
| Counter 20G + Thimet 20G | B 5 d Pre-peak Post B | 7.5 lb 4.9 lb | 1.5 1.0 | 10,514 ab | 33.0 a | 16.95 a | 1,300 |
| Counter 20G + Thimet 20G | B 11 d Pre-peak Post B | 7.5 lb 7 lb | 1.5 1.4 | 10,349 ab | 32.7 a | 16.73 a | 1,266 |
| Counter 20G | B | 8.9 lb | 1.8 | 10,332 ab | 33.0 a | 16.68 a | 1,249 |
| Counter 20G | B | 7.5 lb | 1.5 | 9,737 bc | 32.9 a | 16.05 a | 1,086 |
| Check | ----- | ---- | ----- | 8,595 c | 27.6 b | 16.55 a | 1,029 |
| LSD (0.05) | | | | 1,204.6 | 2.41 | 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; Post B = postemergence band

Yield trends in this experiment suggested an advantage to using the higher rate of Counter 20G (8.9 lb product/ac) at planting time plus postemergence Thimet 20G earlier (11 days ahead of peak fly activity). This treatment generated $150/ac more gross revenue per acre than when the Thimet was applied at 5 days pre-peak. Similarly, when lower rates of both Counter 20G (7.5 lb/ac) and Thimet 20G (4.9 lb/ac) were used for SBRM management, applying the postemergence Thimet 11 days pre-peak resulted in an increase in gross revenue by $67/ac when compared to revenue from the same program if the Thimet was applied at 5 days ahead of peak fly.

Adding postemergence applications of Thimet 20G to plots initially treated with a planting-time application of Counter 20G at its high (8.9 lb/ac) labeled rate generated gross economic return increases that ranged from $73 to $223 per acre above the revenue from planting-time-only applications of Counter at 8.9 lb per acre. Similarly, plots initially treated at planting with Counter at the moderate (7.5 lb product/ac) rate produced revenue increases of between $180 and $281/ac when a postemergence application of Thimet was added. Plots that received 7.5 lb of Counter at planting and a postemergence rescue application of Lorsban Advanced three days ahead of peak fly generated an increase in gross economic return of $251/ac.

As observed in previous years of testing, the results of this experiment showed that combining at-plant Counter 20G with postemergence applications of Thimet 20G provides effective control of the sugarbeet root maggot, and that Thimet performance is not significantly impacted by application timing (i.e., seven days pre-peak vs. peak fly) or rate. This allows growers a wide window of flexibility in relation to when the Thimet must be applied to achieve satisfactory SBRM control. The additional economic returns from postemergence insecticide applications in this experiment provide ample justification for the use of these materials to provide additive control of the sugarbeet root maggot. The fact that insecticide protection, in the form of either a single at-plant insecticide or a dual-insecticide program, increased gross economic returns by between $57 and $443/ac above the untreated

check provides strong evidence regarding the economic importance of the sugarbeet root maggot as a serious pest of sugarbeet. Effective SBRM management programs, such as the dual-insecticide programs tested in this experiment, will be essential to ensuring the profitability of sugarbeet production in areas affected by moderate to high infestations of this pest.

**References Cited:**

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