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

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Introduction:

Previous research suggests that recently labeled seed treatment insecticides can provide control of moderate infestations of the sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder), but should not be used as stand-alone programs to manage high to severe SBRM infestations (Boetel et al. 2009). This, coupled with the surprisingly high adoption rate of seed treatment insecticides for insect pest management in the Red River Valley production area, has precipitated a renewed interest in optimizing postemergence tools for SBRM management. The key objective of this experiment was to determine the optimal timing and application rate of Thimet 20G 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 15G (i.e., 10 and 11.9 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 5 June at a field site near Auburn (Walsh 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. 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. The experiment was arranged in a randomized complete block design with four replications of the treatments. Counter 15G was used as planting time insecticide for all treatments, and was applied at either the standard (10 lb product/ac) or the highest (11.9 lb) labeled rate. All planting-time treatments were applied as 5-inch bands over the rows by using Gandy™ row banders.

Postemergence Thimet 20G granules were applied at either nine or four days before anticipated peak fly activity (i.e., June 17 or 22 June), and rates of Thimet 20G included 4.9 and 7 lb product/ac. Granular output was 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 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.

For comparative purposes, a treatment of Lorsban 4E, applied at 1 pt product/ac in a 7-inch band, was also included in this experiment. The Lorsban 4E was applied on 24 June, which was 2 days before peak fly activity. To avoid confounding effects from neighboring treatments that did not receive a treatment capable of killing SBRM flies, plots treated with Lorsban 4E were three tractor passes wide rather than the standard single pass. However, all treatment assessments were carried out in the inner four rows of the center tractor pass as with standard-sized plots.

<u>Root injury ratings</u>: Root maggot feeding injury was assessed on 12 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). Performance was also compared using sugarbeet yield parameters.

<u>Harvest</u>: All foliage was removed from plots immediately before harvest on 23 September by using a commercial-grade mechanical defoliator. On the same day, all beets from the center 2 rows of each plot were lifted 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 Quality 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 results are presented in Table 1. The untreated checks incurred relatively high levels of SBRM feeding injury (i.e., average of 7.45 on the 0 to 9 scale), which suggested that the test was highly infested with sugarbeet root maggot larvae. All insecticide regimes in the experiment resulted in significant reductions in SBRM feeding injury when compared to that observed in the untreated check plots.

A general trend suggested that applying Thimet 20G closer to peak fly activity (i.e., 4 rather than 9 days pre-peak) tended to provide slightly better protection from SBRM feeding injury. For example, when postemergence Thimet was applied at the low (4.9 lb product/ac) rate closer (4 days before) to peak fly activity, plots had significantly lower maggot injury than when Thimet was applied earlier (9 days pre-peak) at the same rate. The later application of Thimet 20G in this comparison resulted in a difference of over a full point less SBRM feeding injury on the 0 to 9 rating scale when compared to plots treated earlier (9 days pre-peak). This was the only case where a significant difference in root maggot feeding injury was observed in relation to Thimet application timing. Although application rate did not impact Thimet 20G performance, postemergence applications did reduce root maggot feeding injury. For example, when plots were initially treated with an at-plant application of Counter 15G at 10 lb product/ac, a postemergence application of Thimet 20G (4.9 or 7 lb product/ac) at four days before peak SBRM fly activity resulted in significantly less larval feeding injury than when no postemergence Thimet was used. Applying Thimet early (i.e., 9 days pre-peak) at either rate did not provide a significant improvement in root protection over that of the single at-plant application of Counter 15G at its moderate rate of 10 lb product/ac. There was no effect of Thimet application timing when Counter was applied at planting time at its high (11.9 lb) label rate. There were no additional impacts of timing or rate on Thimet performance with respect to SBRM feeding injury.

Table 1. *Larval feeding injury* in evaluation of the impacts of application timing and rate on performance of Thimet 20G for postemergence control of sugarbeet root maggot, Auburn, ND, 2009

Treatment/form.	Placement[a]	Rate (product/ac)	Rate (lb a.i./ac)	Root injury (0-9)
Counter 15G + Thimet 20G	B 4 d pre-peak B	10 lb 7 lb	1.5 1.4	2.70 d
Counter 15G	B	11.9 lb	1.8	2.73 cd
Counter 15G + Thimet 20G	B 4 d pre-peak B	11.9 lb 7 lb	1.8 1.4	2.90 cd
Counter 15G + Thimet 20G	B 9 d pre-peak B	11.9 lb 7 lb	1.8 1.4	2.93 cd
Counter 15G + Thimet 20G	B 4 d pre-peak B	10 lb 4.9 lb	1.5 1.0	3.08 cd
Counter 15G + Thimet 20G	B 9 d pre-peak B	10 lb 7 lb	1.5 1.4	3.55 bcd
Counter 15G + Lorsban 4E	B 2 d pre-peak 7" Post B	10 lb 1 pt	1.5 0.5	3.65 bc
Counter 15G + Thimet 20G	B 9 d pre-peak B	10 lb 4.9 lb	1.5 1.0	4.20 b
Counter 15G	B	10 lb	1.5	4.38 b
Check	-----	----	-----	7.45 a
LSD (0.05)				0.93

Means within a column sharing a letter are not significantly (P = 0.05) different from each other (Fisher's Protected LSD test).
[a]B = band; Post B = postemergence band

Yield results are presented in Table 2. All insecticide-treated plots produced greater root and recoverable sucrose yields than the untreated check plots. Significant yield impacts from postemergence applications of Thimet were rare in the 2009 run of this experiment, which probably was a product of the late planting date of the trial.

Plots that only received stand-alone planting-time insecticide treatments produced good sucrose and root tonnage yields, which were not significantly different from any of the dual (planting-time plus postemergence) entries. The late planting date probably resulted in sufficient levels of insecticide active ingredient being present at the time of root maggot larval feeding injury irrespective of whether a postemergence application was used.

The combination of planting-time Counter 15G at its high (11.9 lb) rate plus postemergence Thimet at 4 days before peak fly activity produced significant increases in recoverable sucrose and root yields over those of the same combination when Thimet was applied earlier (9 days pre-peak). This followed a general pattern of this trial in that earlier (i.e., 9 rather than 4 days pre-peak) applications of Thimet tended to produce lower recoverable sucrose and root yields than later applications. Lower revenue values also resulted from earlier applications of postemergence Thimet. These findings may not have been related to insect control, but could have resulted from the unusually late planting date. Excessive amounts of toxicant from the combination of planting time and postemergence applications at such high rates could have been phytotoxic to the resultant young sugarbeet plants.

Although yield differences in this study were rare, the best economic returns were generated by plots that received later (i.e., 4 days before peak fly activity) applications of postemergence Thimet 20G. The application of Thimet at its high (7 lb) rate at 4 days pre-peak to plots initially treated with Counter at 11.9 lb product/ac resulted in a revenue increase of $72 when compared to plots that received the Thimet at 9 days pre-peak. However, the results of this experiment still tend to support the findings from our previous research on this topic in that application timing does not appreciably impact on performance of Thimet 20G when the material is applied postemergence.

Table 2. *Yield parameters* from evaluation of the impacts of application timing and rate on performance of Thimet 20G for postemergence control of sugarbeet root maggot, Auburn, ND, 2009

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 + Thimet 20G	B 4 d pre-peak B	11.9 lb 7 lb	1.8 1.4	5485 a	22.6 ab	13.35 a	474
Counter 15G + Thimet 20G	B 4 d pre-peak B	10 lb 4.9 lb	1.5 1.0	5323 ab	22.1 ab	13.30 a	455
Counter 15G + Thimet 20G	B 4 d pre-peak B	10 lb 7 lb	1.5 1.4	5216 ab	22.0 ab	13.15 ab	429
Counter 15G	B	11.9 lb	1.8	5096 ab	21.2 abc	13.23 a	432
Counter 15G + Thimet 20G	B 9 d pre-peak B	10 lb 7 lb	1.5 1.4	5033 ab	22.7 a	12.48 b	347
Counter 15G	B	10 lb	1.5	4983 ab	21.1 abc	13.05 ab	404
Counter 15G + Lorsban 4E	B 2 d pre-peak 7” Post B	10 lb 1 pt	1.5 0.5	4981 ab	21.6 abc	12.83 ab	382
Counter 15G + Thimet 20G	B 9 d pre-peak B	10 lb 4.9 lb	1.5 1.0	4885 b	20.9 bc	13.03 ab	390
Counter 15G + Thimet 20G	B 9 d pre-peak B	11.9 lb 7 lb	1.8 1.4	4811 b	20.2 c	13.15 ab	402
Check	-----	----	-----	2950 c	14.6 d	11.63 c	147
LSD (0.05)				848	1.8	0.75	

Means within a column sharing a letter are not significantly (P = 0.05) different from each other (Fisher’s Protected LSD test).
[a] B = band; Post B = postemergence band; Seed = insecticidal seed treatment

References Cited:

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