VYDATE INSECTICIDE FOR SUGARBEET ROOT MAGGOT CONTROL

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Introduction

The sugarbeet root maggot (SBRM), *Tetanops myopaeformis* (Röder), is a serious economic pest of sugarbeet in the Red River Valley growing area. Only a small number of insecticidal options are available to growers for managing the SBRM. This experiment was carried out to answer the following questions pertaining to Vydate insecticide as a potential material for protecting sugarbeet from SBRM feeding injury and associated yield losses.

1. Will Vydate be effective as a planting-time soil insecticide?
2. Does tank-mixing micro-rate herbicides with Vydate impact its efficacy against the SBRM?
3. Will combining micro-rate herbicide mixes with Vydate insecticide cause crop injury?
4. Can band width affect performance of postemergence Vydate?
5. In what type of insecticidal program will Vydate be most effective?
    a. Postemergence Vydate without planting-time treatment
    b. Planting-time Vydate + postemergence Vydate
    c. Poncho/cyfluthrin seed treatment followed by postemergence Vydate
    d. Planting-time standard (e.g., Counter) + postemergence Vydate
6. What rate of Vydate will be needed for adequate SBRM control?

Materials and Methods:

This experiment was planted on May 6, 2004 at St. Thomas, ND with Crystal 822 variety seed. Planting was done using a 6-row John Deere 71 Flex planter with 22-inch row spacing. The 4 center rows were treated and the outer row on each side served as an untreated buffer. The experiment was arranged in a randomized complete block design with four replications. Seed spacing was one every 4 1/8 inches, and seeding depth was 1¼ inches. Each plot was 35 feet long, and 25-foot tilled alleys were maintained between replicates. Plots that received a postemergence liquid insecticide application were three passes (18 rows) wide to minimize the amount of invasion by adult females from neighboring treatment plots.

<u>Planting-time treatments</u>: The planting-time insecticide standard (Counter 15G) was applied using modified in-furrow placement (dropped down the tube over the row as far back from the seed drop zone and in front of the rear press wheel) at a rate of 10 lb product/acre. Output of the insecticide granules was controlled by using planter-mounted Noble metering units. All granular treatments were applied with some soil covering the seed before the insecticide entered the seed furrow. Modified in-furrow placement usually results in delivery of a 2.5-inch band with the heaviest concentration of insecticide falling directly over the seed row. It is very important to ensure that no insecticide comes into contact with the seed when using this placement method because many insecticides, especially the organophosphates, are phytotoxic to sugarbeet seedlings.

Experimental applications of the liquid insecticide Vydate C-LV were made at planting using a planter-mounted Raven™ liquid application system. Rates of 34 and 68 fl oz product/acre were applied in a finished spray volume of 5 GPA by using 6501E nozzles. The entire spray stream was directed lenghthwise (parallel) into the open seed furrow to place all of the liquid spray output into the furrow. All water used in Vydate applications was buffered to pH 6.0.

One entry in the experiment included a dual seed treatment of Poncho+Cyfluthrin (30 and 8 g ai/unit, respectively) in combination with postemergence Vydate at 34 fl oz product/acre to determine the pest management potential of the combination as a program for root maggot control. The same seed (Crystal 822) was used for this seed treatment and all others in the experiment. The seed treatment was applied to seed by personnel at ASTEC, Inc. (Sheridan, WY).

Postemergence insecticide applications: Postemergence treatments were made by using a tractor-mounted CO_2 spray system equipped with TeeJet 6501E nozzles that were calibrated to deliver a finished spray volume of 10 GPA. As described for the planting-time treatments, the postemergence treatments were also applied to the inner four rows of each plot. Vydate C-LV applications were timed to target specific stages of sugarbeet development. The first applications were made on June 17 during the 4-leaf stage. Treatments were applied in either 7- or 11-inch bands over the row. Two treatments were included to test the impact of tankmixing a common micro-rate herbicide combination (Betamix 8 fl oz, Upbeet 1/8 oz, Stinger 1.3 fl oz, Select 2 fl oz, and MSO 1.5% v/v) with Vydate. Vydate applications directed at the 6-leaf stage were applied June 23 using the same equipment and spray volume as described for the 2-leaf treatments.

Damage ratings: Root maggot feeding injury was assessed in the plots 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). All root ratings for this experiment were carried out on August 17.

Harvest: Performance was also evaluated based on sugarbeet yield parameters. This experiment was harvested on September 27. Foliage was removed from 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.

Data analysis: 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 rating results from this trial are presented in Table 1. Treatments are listed in order of performance from the best root protection at the top to the lowest performance (highest root damage) on the bottom. The yield data appear in Table 2, and treatments are also listed from best to worst, but according to their average recoverable sucrose yield.

Combinations involving Counter 15G at plant followed by postemergence Vydate were generally more effective than those that included Vydate at both planting-time and postemergence. In fact, the combination of Counter at planting at the medium label rate of 10 lb product/acre followed by Vydate at 34 fl oz/acre was the top-yielding treatment in the study. In comparing sucrose yields, the Counter+Vydate treatment outperformed the entry that included a Poncho+Cyfluthrin seed treatment at its low rate (30+8 g ai/unit of seed). It should be noted that the seed treatment used in this study was applied at 50% of the highest rate we tested in a separate study. Future research should include higher rates of the Poncho+Cyfluthrin material in combination with Vydate at postemergence.

Spreading out the band width of postemergence Vydate applications from 7 to 11 inches did not increase or compromise protection from root maggot feeding injury or yield in this study. Tank-mixing Vydate with micro-rate herbicides did not cause reductions in root protection or yield, nor did it result in any detectable crop injury. Planting-time applications of Vydate did not appear to provide improvements in control in this experiment.

Although two postemergence (4- and 6-leaf) applications of Vydate resulted in significantly lower root maggot feeding injury than a single post treatment, the difference did not translate to a yield benefit. Overall, post-applied Vydate did not perform as well as it had in 2003. The postemergence applications of Vydate were probably applied too early to achieve sufficient control. This was most likely due to the late and prolonged maggot infestations that occurred in 2004. Although the research and development group for the manufacturer of Vydate had hoped that future labeling would have instructions for applying the product based on plant phenology (e.g., 2-, 4-, and/or 6-leaf), these findings suggest that the applications of Vydate should be timed according to development of the insect population (i.e., peak fly activity) rather than the growth stage of sugarbeet plants.

Table 1. *Feeding injury* in test of Vydate experimental insecticide applied at planting and/or postemergence to control sugarbeet root maggot, St. Thomas, ND, 2004.

Treatment/form.	Placement	Rate (product/ac)	Rate (ai/ac)	Root injury (0-9)
Vydate C-LV + Vydate C-LV + Vydate C-LV	IF 4-leaf 7" Post B 6-leaf 7" Post B	68 fl oz 34 fl oz 34 fl oz	2.0 lb 1.0 lb 1.0 lb	4.05 d
Counter 15G + Vydate C-LV + micro-rate	M 4-leaf 11" Post B	10 lb 34 fl oz	1.5 lb 1.0 lb	4.58 cd
Counter 15G + Vydate C-LV + micro-rate	M 4-leaf 7" Post B	10lb 34 fl oz	1.5 lb 1.0 lb	4.70 cd
Counter 15G + Vydate C-LV	M 4-leaf 7" Post B	10 lb 34 fl oz	1.5 lb 1.0 lb	4.75 cd
Vydate C-LV + Vydate C-LV + Vydate C-LV	IF 4-leaf 7" Post B 6-leaf 7" Post B	34 fl oz 34 fl oz 34 fl oz	1.0 lb 1.0 lb 1.0 lb	4.90 cd
Counter 15G	M	10 lb	1.5 lb	5.08 bc
---- Vydate C-LV + Vydate C-LV	---- 4-leaf 7" Post B 6-leaf 7" Post B	---- 34 fl oz 34 fl oz	---- 1.0 lb 1.0 lb	5.28 bc
Poncho:Cyfluthrin + Vydate C-LV	Seed 4-leaf 7" Post B	 34 fl oz	30:8 g ai/unit 1.0 lb	5.30 bc
Vydate C-LV + Vydate C-LV	IF 4-leaf 7" Post B	34 fl oz 34 fl oz	1.0 lb 1.0 lb	5.93 b
Check	-----	----	-----	7.40 a
LSD (0.05)				0.87

Table 2. *Yield parameters* from plots treated with Vydate experimental insecticide at planting and/or postemergence to control sugarbeet root maggot, St. Thomas, ND, 2004.

Treatment/form.	Placement	Rate (product/ac)	Rate (ai/ac)	Recoverable sucrose (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Counter 15G + Vydate C-LV	M 4-leaf 7" Post B	10 lb 34 fl oz	1.5 lb 1.0 lb	5141 a	17.0 a	16.05 ab	564
Counter 15G + Vydate C-LV + micro-rate	M 4-leaf 11" Post B	10 lb 34 fl oz	1.5 lb 1.0 lb	4843 ab	16.6 ab	15.63 ab	514
Counter 15G	M	10 lb	1.5 lb	4836 ab	16.0 abc	16.13 a	533
Counter 15G + Vydate C-LV + micro-rate	M 4-leaf 7" Post B	10 lb 34 fl oz	1.5 lb 1.0 lb	4696 abc	15.7 a-d	15.98 ab	511
Vydate C-LV + Vydate C-LV + Vydate C-LV	IF 4-leaf 7" Post B 6-leaf 7" Post B	68 fl oz 34 fl oz 34 fl oz	2.0 lb 1.0 lb 1.0 lb	4601 a-d	15.7 a-d	15.78 ab	491
Poncho:Cyfluthrin + Vydate C-LV	Seed 4-leaf 7" Post B	 34 fl oz	30:8 g ai/unit 1.0 lb	4117 b-e	14.2 b-e	15.56 ab	434
--- Vydate C-LV + Vydate C-LV	---- 4-leaf 7" Post B 6-leaf 7" Post B	---- 34 fl oz 34 fl oz	---- 1.0 lb 1.0 lb	3977 cde	13.6 cde	15.65 ab	423
Vydate C-LV + Vydate C-LV	IF 4-leaf 7" Post B	34 fl oz 34 fl oz	1.0 lb 1.0 lb	3837 def	13.3 def	15.50 b	401
Vydate C-LV + Vydate C-LV + Vydate C-LV	IF 4-leaf 7" Post B 6-leaf 7" Post B	34 fl oz 34 fl oz 34 fl oz	1.0 lb 1.0 lb 1.0 lb	3790 ef	13.0 ef	15.63 ab	400
Check	----	----	----	3052 f	11.0 f	14.93 c	304
LSD (0.05)				792	2.5	0.57	

References Cited:

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