

# TANK-MIXING ROUNDUP HERBICIDE WITH POSTEMERGENCE LIQUID INSECTICIDES: IMPACTS ON ROOT MAGGOT CONTROL

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## Introduction:

Roundup-Ready (glyphosate-resistant) sugarbeet has been widely adopted by producers in the Red River Valley growing area. In addition to presenting opportunities for weed control strategies, the addition of Roundup herbicide to the arsenal of crop protection materials for use in sugarbeet also presents new questions regarding its use in combination with foliar-applied liquid insecticides to control the sugarbeet root maggot, (SBRM) *Tetanops myopaeformis* (Röder). This experiment was carried out to determine the impacts of tank mixtures comprised of Roundup herbicide with postemergence liquid insecticides on root maggot control and yield.

## Materials and Methods:

This study was carried out at a field site near Auburn (Walsh County), ND. The experiment was planted on 5 June using BTS 86RR66 seed 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. All plots, including the check, received a planting-time application of Counter 15G at its standard (10 lb product/ac) rate, because the focus of the experiment was on impacts of the tank-mixed postemergence combinations. Counter was applied in 5-inch bands over the rows by using Gandy™ row banders. The untreated check was a hand-weeded control and did not receive Roundup herbicide applications. A Roundup-only treatment was also included in the study to serve as a no-postemergence insecticide control.

Insecticides in the experiment included Lorsban 4E (either 1 or 2 pts product/ac) and the *experimental* (i.e., unregistered in sugarbeet) insecticide Vydate C-VL (17 or 34 fl oz product/ac), and each was applied either alone or as a tankmixed combination with Roundup Original Max at 1 qt/ac. All postemergence treatments were broadcast-applied on 25 June by using a tractor-mounted CO<sub>2</sub> spray system that delivered a finished spray volume of 10 GPA using TeeJet 11001VS nozzles. All plots in this experiment were bordered on either side by a 6-row buffer to minimize the likelihood of drift affecting the adjacent plot.

Root injury: Root maggot feeding injury was assessed on 11 and 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). Treatment performance was also compared on the basis of sugarbeet yield parameters.

Harvest: On 22 September, all foliage was removed from plots immediately before harvest by using a commercial-grade mechanical defoliator. Shortly thereafter, 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 12-18 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 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:

It is important to note that all entries in this study, including the check, received a planting-time application of Counter 15G at a moderate (10 lb product/ac) rate, because the main objective of the experiment was to determine impacts of postemergence tank mixtures containing Roundup herbicide and a postemergence liquid insecticide. No reductions in root maggot control were observed when Roundup Original Max was combined with either Lorsban 4E or Vydate C-LV. In fact, the best protection from SBRM feeding injury in this experiment was the tank-mixed combination containing Lorsban 4E at its high (2 pts product/ac) rate, combined with Roundup Original Max. Similarly, good control was provided by Vydate C-LV when it was combined with Roundup, although root maggot control was also achieved with Vydate and Lorsban applications that lacked Roundup herbicide. The only insecticide/herbicide tank mixture that failed to produce a significant reduction in SBRM feeding injury was the combination of Vydate C-LV at its low (17 fl oz product/ac) rate, tank-mixed with Roundup. This probably was most likely a product of the low application rate of Vydate, and not the fact that it was tank-mixed with Roundup.

**Table 1. Larval feeding injury in evaluation of tankmixed combinations containing Roundup and postemergence liquid insecticides for sugarbeet root maggot control, Auburn, ND, 2009**

Treatment/form.	Placement	Rate (product/ac)	Rate (lb a.i./ac)	Root injury (0-9)
Lorsban 4E + Roundup Original Max	Post Broadcast	2 pts 1 qt	1.0 1.13	2.28 c
Vydate C-LV + Roundup Original Max	Post Broadcast	34 fl oz 1 qt	1.0 1.13	2.55 bc
Vydate C-LV	Post Broadcast	34 fl oz	1.0	2.58 bc
Vydate C-LV	Post Broadcast	17 fl oz	0.5	2.58 bc
Lorsban 4E	Post Broadcast	2 pts	1.0	2.65 bc
Lorsban 4E + Roundup Original Max	Post Broadcast	1 pt 1 qt	0.5 1.13	2.68 bc
Check	----	----	----	2.75 bc
Vydate C-LV + Roundup Original Max	Post Broadcast	17 fl oz 1 qt	0.5 1.13	3.03 ab
Roundup Original Max	Post Broadcast	1 qt	1.13	3.08 ab
Lorsban 4E	Post Broadcast	1 pt	0.5	3.40 a
LSD (0.05)				0.60

Means within a column sharing a letter are not significantly ( $P = 0.05$ ) different from each other (Fisher's Protected LSD test).

As observed with other studies conducted at this site in 2009, yields for this trial were generally low. However, the relative yield results among the treatments were encouraging, because there were no significant differences in yield between any of the treatments. Also encouraging was the fact that tank-mixed combinations involving either Lorsban 4E or Vydate C-LV with Roundup Original Max tended to yield slightly more recoverable sucrose yield and root tonnage than the insecticide-only or Roundup-only treatments, although none of those differences were significant. Similar to the findings on root maggot feeding injury, this yield data also showed that gross economic return from tank-mixed combinations was as good, and often better than insecticide- or herbicide-only treatments.

Overall, the results of this trial suggest that there are no apparent negative impacts on sugarbeet root maggot control or resulting sugarbeet yield, quality, or gross economic return from tank-mixing either Lorsban 4E or Vydate C-LV foliar liquid insecticides with Roundup Original Max herbicide in sugarbeet. It should be noted that this is the first major trial of these tank-mixed combinations in Red River Valley sugarbeet, and that it is comprised of only one year of data. Thus, the experiment should be repeated to enable more concrete conclusions.

**Table 2. Yield parameters from evaluation of tankmixed combinations containing Roundup and postemergence liquid insecticides for sugarbeet root maggot control, Auburn, ND, 2009**

Treatment/form.	Placement	Rate (product/ac)	Rate (lb a.i./ac)	Sucrose yield (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return (\$/ac)
Vydate C-LV + Roundup Original Max	Post Broadcast	17 fl oz 1 qt	0.5 1.13	5400 a	22.1 a	13.65 a	473
Lorsban 4E + Roundup Original Max	Post Broadcast	1 pt 1 qt	0.5 1.13	5327 a	22.9 a	13.10 a	417
Lorsban 4E	Post Broadcast	1 pt	0.5	5315 a	22.2 a	13.33 a	448
Lorsban 4E + Roundup Original Max	Post Broadcast	2 pts 1 qt	1.0 1.13	5247 a	23.0 a	12.93 a	392
Vydate C-LV + Roundup Original Max	Post Broadcast	34 fl oz 1 qt	1.0 1.13	5205 a	21.9 a	13.35 a	431
Vydate C-LV	Post Broadcast	34 fl oz	1.0	5158 a	21.6 a	13.38 a	431
Vydate C-LV	Post Broadcast	17 fl oz	0.5	5150 a	21.5 a	13.45 a	434
Check	-----	----	-----	5122 a	22.7 a	12.88 a	374
Roundup Original Max	Post Broadcast	1 qt	1.13	5008 a	21.8 a	12.98 a	382
Lorsban 4E	Post Broadcast	2 pts	1.0	4755 a	20.4 a	13.18 a	377
LSD (0.05)				NS	NS	NS	

Means within a column sharing a letter are not significantly ( $P = 0.05$ ) different from each other (Fisher's Protected LSD test).

**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. Sugar Beet Res.* 37: 57–69.

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