COMBINING ROUNDUP POWERMAX HERBICIDE WITH POSTEMERGENCE LIQUID INSECTICIDES: IMPACTS ON ROOT MAGGOT CONTROL

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Introduction:

Many sugarbeet producers in the Red River Valley growing area have adopted Roundup-Ready (glyphosate-resistant) sugarbeet for use in their production systems. Although glyphosate use has changed the way producers manage weeds in sugarbeet, it also has raised 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 PowerMax herbicide with postemergence liquid insecticides on SBRM control and associated yield parameters.

Materials and Methods:

This experiment was carried out in a grower field near St. Thomas (Pembina County), ND. The experiment was planted on 12 May with glyphosate-resistant Betaseed 87RR38 seed using a 6-row John Deere 71 Flex planter which was adjusted 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.

Postemergence insecticides in the experiment included Lorsban Advanced (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 both rates of each insecticide were applied either alone or as a tank-mixed combination with Roundup PowerMax. Roundup was applied at 32 fl oz/ac in case where it was part of a treatment regime, and all Roundup applications included dry ammonium sulfate (AMS) at a rate of 4 lb product/100 gal of spray solution. All postemergence treatments were broadcast-applied on 9 June by using a tractor-mounted CO_2 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 August by randomly collecting ten 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 6 October, 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, 2008), and treatment means were separated using Fisher's protected least significant difference (LSD) test at a 0.05 level of significance.

Results and Discussion:

Results of this experiment should be interpreted with the understanding that all entries, including the check, received a planting-time application of Counter 15G at a rate of 10 lb product/ac. The reason for this experimental design feature was that the main focus of this trial was on postemergence tank mixtures comprised of liquid insecticides and Roundup PowerMax herbicide. Thus, by initially treating all plots with the same planting-time insecticide protection, we were better able to detect any impacts, either negative or positive, of the single and tank-mixed postemergence sprays on sugarbeet root maggot control.

One concern from this trial was that a whitish precipitate was formed in sprayer screens during mixing and application of tank-mixed combinations that included Lorsban Advanced. That phenomenon was not observed when the 4E formulation of Lorsban was used in previous testing. This will be further researched in future testing.

Root injury rating data indicated that there were no significant differences among treatments in this experiment with regard to protection from SBRM feeding injury (Table 1). Also, there were no apparent trends associated with either tank mixed combinations or pesticide application rates.

Table 1. *Larval feeding injury* in evaluation of tank-mixed combinations containing Roundup PowerMax herbicide and postemergence liquid insecticides for sugarbeet root maggot control, St. Thomas, ND, 2010

Treatment/form.[a]	Placement	Rate (product/ac)	Rate (lb a.i. or a.e./ac)	Root injury (0-9)
Lorsban Advanced + Roundup PowerMax	Post Broadcast	1 pt 32 fl oz	0.5 a.i. 1.13 a.e.	5.10 a
Lorsban Advanced	Post Broadcast	2 pts	1.0 a.i.	5.17 a
Vydate C-LV + Roundup PowerMax	Post Broadcast	17 fl oz 32 fl oz	0.5 a.i. 1.13 a.e.	5.23 a
Vydate C-LV + Roundup PowerMax	Post Broadcast	34 fl oz 32 fl oz	1.0 a.i. 1.13 a.e.	5.43 a
Vydate C-LV	Post Broadcast	17 fl oz	0.5 a.i.	5.57 a
Roundup PowerMax	Post Broadcast	32 fl oz	1.13 a.e.	5.90 a
Lorsban Advanced + Roundup PowerMax	Post Broadcast	2 pts 32 fl oz	1.0 a.i. 1.13 a.e.	6.00 a
Lorsban Advanced	Post Broadcast	1 pt	0.5 a.i.	6.20 a
Vydate C-LV	Post Broadcast	34 fl oz	1.0 a.i.	6.37 a
Control (Counter 15G Banded, 10 lb prod./ac)	-----	----	-----	6.73 a
LSD (0.05)				NS

Means within a column sharing a letter are not significantly ($P = 0.05$) different from each other (Fisher's Protected LSD test).
[a] All plots, including Controls, received an initial application of Counter 15G, banded at 10 lb product/ac.

As observed with root injury ratings, the results of harvest assessments in this experiment indicated that there were no significant differences among treatments in relation to any of the yield parameters measured (Table 2). Although not statistically significant, slight reductions in sucrose yield and root tonnage were apparent when Lorsban Advanced was applied at its high (2 pt/ac) rate, regardless of whether it was applied alone or tank mixed with Roundup PowerMax. This certainly bears more study. Beyond that slight trend there were no other consistent trends with regard to tank mixtures or application rates with regard to the yield components that were compared.

In general, the results of this experiment support our previous findings of no major impacts on root maggot control or sugarbeet yield parameters from combining liquid insecticides with glyphosate-based herbicide products in single-application tank mixtures. As mentioned above, one factor that contributed to the general lack of significant differences among treatments in this experiment was that all plots, including the controls, received a planting-time application of Counter 15G. Another important consideration regarding this trial was that, due to frequent and often high rainfall events that occurred at this site, postemergence treatments could not be applied at the preferred timing of 2 to 3 days before peak SBRM fly activity. Unfortunately, these treatments were applied at 5

days after peak activity (June 09, 2010). This probably also had a major influence on the general lack of treatment differences in this experiment. Therefore, this research should be continued under more normal growing conditions.

Table 2. *Yield parameters* from evaluation of tank-mixed combinations containing Roundup PowerMax herbicide and postemergence liquid insecticides for sugarbeet root maggot control, St. Thomas, ND, 2010

Treatment/form.[a]	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 PowerMax	Post Broadcast	34 fl oz 32 fl oz	1.0 a.i. 1.13 a.e.	8939 a	30.6 a	16.30 a	1279
Vydate C-LV	Post Broadcast	17 fl oz	0.5 a.i.	8851 a	30.1 a	16.60 a	1277
Lorsban Advanced	Post Broadcast	1 pt	0.5 a.i.	8429 a	28.3 a	16.70 a	1232
Lorsban Advanced + Roundup PowerMax	Post Broadcast	1 pt 32 fl oz	0.5 a.i. 1.13 a.e.	8242 a	27.6 a	16.67 a	1208
Lorsban Advanced + Roundup PowerMax	Post Broadcast	2 pts 32 fl oz	1.0 a.i. 1.13 a.e.	7767 a	28.8 a	15.70 a	999
Vydate C-LV + Roundup PowerMax	Post Broadcast	17 fl oz 32 fl oz	0.5 a.i. 1.13 a.e.	7705 a	26.0 a	16.57 a	1119
Control (Counter 15G Banded, 10 lb prod./ac)	-----	----	-----	7494 a	25.3 a	16.67 a	1088
Roundup PowerMax	Post Broadcast	32 fl oz	1.13 a.e.	7482 a	24.8 a	16.73 a	1109
Lorsban Advanced	Post Broadcast	2 pts	1.0 a.i.	6864 a	23.6 a	16.57 a	976
Vydate C-LV	Post Broadcast	34 fl oz	1.0 a.i.	6513 a	22.6 a	16.20 a	918
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).

[a] All plots, including Controls, received an initial application of Counter 15G, banded at 10 lb product/ac.

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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