LYGUS BUG CONTROL AND SUGARBEET YIELD IMPACTS FROM TANK-MIXING FOLIAR INSECTICIDES AND FUNGICIDES

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Introduction:

The Tarnished plant bug is one of several plant bugs belonging to the genus *Lygus*, hence, the common name "Lygus bug." Lygus bug outbreaks have occurred sporadically in North Dakota and Minnesota sugarbeet fields since 1998. Both adults and nymphs (immatures) cause feeding injury to sugarbeet. They use piercing and sucking mouthparts to penetrate the plant, inject a tissue-liquifying toxin, and ingest the resulting liquid. Lygus bugs have only recently been recognized as economic pests of sugarbeet in North America. Thus, only a few insecticide materials are specifically labeled for their control in sugarbeet in the United States. In addition, little is known regarding the effectiveness of registered insecticides or their compatibility with fungicides used to control *Cercospora* leaf spot in sugarbeet. This study was carried out with the following objectives: 1) to evaluate the performance of foliar insecticides at controlling Lygus bugs in sugarbeet; and 2) to monitor for possible plant injury and yield losses due to phytotoxic interactions between the insecticides and two commonly used foliar fungicides.

Materials & Methods:

This study was conducted in a commercial sugarbeet field site near Hoople, ND during the 2003 growing season. Whole-plant visual counts were taken on five plants in each plot 2 days before treatment applications, and indicated a pretreatment infestation level of about 1.8 Lygus bugs (adults and nymphs combined) per plant. The majority (70.5%) were nymphs at the time of spraying.

A total of 14 treatment combinations were arranged in a randomized complete block design with four replications. Individual plots were 25 ft long and 7 rows (22-inch spacing) wide. All insecticide products evaluated in the experiment were registered for use in sugarbeet, although the only insecticides that had a specific listing of Lygus bug control in the sugarbeet portion of their label were Dibrom 8 and Lorsban 4E. All insecticides were applied alone and as a tank mixture with Eminent 125SL fungicide to determine whether the combination would impact insecticide performance or sugarbeet yield parameters. An additional tank mixture of Lannate insecticide with SuperTin fungicide was also evaluated. In all cases, companion fungicide-only treatments were included as non-tank-mix controls, and all chemical treatments were compared with an untreated check. Teatments were broadcast-applied on 4 September using a C02 backpack cannister spray system with a 6-ft wide boom that was equipped with 4 Teejet 11002 nozzles. The system was calibrated to deliver a finished spray volume of 20 GPA while traveling at 3 mph. Assessments of control were carried out at 4 and 11 days after treatment using whole-plant visual counts on five plants per plot. The inner 2 rows of each plot were harvested on 30 September using a 2-row mechanical harvester, and subsamples were sent to the American Crystal sugarbeet quality laboratory in East Grand Forks, MN, for sugarbeet quality analyses.

Results & Discussion:

Evaluations at four days after spraying indicated that the following treatments provided significant control of Lygus when compared with the untreated controls: Dibrom 8 + Eminent 125SL, Lorsban 4E (1 pt/ac), Lorsban 4E + Eminent 125SL, Lannate LV + Eminent 125SL, Malathion 57EC at 1 pt/ac, and Malathion 57EC + Eminent 125SL. Good control was also provided by all insecticides and insecticide/fungicide combinations at 11 days after treatment, including the lower (1/2 pt/ac) rate of Lorsban 4E. Trends suggested slightly improved levels of control by tank-mixing the insecticides with fungicides, although the gains were not statistically significant. Interestingly, SuperTin fungicide alone also displayed a moderate level of insecticidal activity in the 11-day counts. This finding is not unusual since many fungicide materials also can be toxic to insects, although growers should not rely on fungicide applications to provide acceptable control of Lygus bugs. Excellent Lygus bug control was achieved at 11 days after treatment with all insecticide treatments. Those that resulted in the lowest numbers of surviving insects included Lannate LV + SuperTin, Lannate LV + Eminent 125SL, Lorsban 4E (both ½ and 1 pt/ac rates, and tank-mixed with Eminent 125SL), and Malathion 57EC (alone and tank-mixed with Eminent).

Table 1. *Lygus bug survival* in sugarbeet treated with foliar-applied registered and

experimental insecticides, Hoople, ND, 2003.

Treatment/form.	Rate (lb product/ac)	Live Lygus bugs / plant	
		4 days after treatment	11 days after treatment
Eminent 125SL	13 oz	1.30 a	0.70 ab
SuperTin	5 oz	1.10 ab	0.45 bc
Check	--	1.10 ab	0.95 a
Dibrom 8	1 pt	0.85 abc	0.15 cd
Lorsban 4E	0.5 pt	0.70 bc	0.10 d
Lannate LV	1 pt	0.70 bc	0.20 cd
Lannate LV + SuperTin	1 pt 13 oz	0.60 bc	0.05 d
Dibrom 8+ Lorsban 4E	0.5 pt 0.5 pt	0.60 bc	0.15 cd
Dibrom 8+ Eminent 125SL	1 pt 13 oz	0.55 c	0.25 cd
Lorsban 4E	1 pt	0.50 c	0.05 d
Lorsban 4E + Eminent 125SL	1 pt 13 oz	0.45 c	0.05 d
Lannate LV + Eminent 125SL	1 pt 13 oz	0.40 c	0.05 d
Malathion 57EC	1.5 pt	0.40 c	0.00 d
Malathion 57EC + Eminent 125SL	1.5 pt 13 oz	0.40 c	0.00 d
LSD (0.05)		0.54	0.35

Yield data somewhat corresponded with post-spray counts of surviving Lygus bugs, but variability among samples minimized the detection of significant differences between treatments (Table 2). Therefore, yield data were analyzed using Fisher's least significant difference (LSD) test at a significance level of 0.1 (i.e., with 90% confidence in treatment comparisons). Numerical yield increases were observed with several treatments, although no insecticide or insecticide/fungicide tank mixture gave a significant benefit when compared with the untreated check in statistical comparisons of either recoverable sucrose or sugarbeet root yield. This suggests that insecticide applications made later than September 1 for Lygus control may not provide economic benefit to the grower.

Treatment with Lannate LV + SuperTin, Dibrom 8 + Eminent 125SL, and Lorsban 4E (1 pt/ac) + Eminent resulted in significant losses in both root yield and recoverable sucrose. Gross economic return for plots treated with Lannate LV, Dibrom 8, and Lorsban 4E (all at 1 pt/acre and without fungicide) averaged $71, $43, and $14 above that from the untreated check plots, respectively; however, it is important to note these values are simply averages and not actual statistical parameters. More importantly, these results demonstrate that significant sugar yield reductions are likely to occur if these insecticide/fungicide tank mixes are applied to sugarbeet. Further research is needed to determine the following: 1) the effectiveness and crop safety of combining lower labeled rates of the insecticides with fungicides; and 2) how close to harvest growers can expect to achieve economic benefits from controlling late-season Lygus infestations in sugarbeet.

Table 2. ***Yield and gross economic return*** **from sugarbeet treated with foliar-applied registered and experimental insecticides, Hoople, ND, 2003.**

Treatment/form.	Rate (lb product/ac)	Recoverable sucrose (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Lannate LV	1 pt	7462 a	26.3 a	15.9	778
Dibrom 8	1 pt	7375 a	26.5 a	15.5	750
Lorsban 4E	1 pt	6903 ab	24.3 ab	15.7	721
Dibrom 8+ Lorsban 4E	0.5 pt 0.5 pt	6878 ab	24.9 ab	15.4	692
SuperTin	5 oz	6809 ab	24.6 ab	15.6	688
Malathion 57EC	1.5 pt	6800 ab	25.4 ab	15.0	658
Lannate LV + Eminent 125SL	1 pt 13 oz	6776 ab	24.4 ab	15.5	689
Check	--	6732 ab	23.5 abc	15.9	707
Eminent 125SL	13 oz	6548 abc	23.5 abc	15.5	668
Malathion 57EC + Eminent 125SL	1.5 pt 13 oz	6384 abcd	22.8 abcd	15.7	654
Lannate LV + SuperTin	1 pt 5 oz	5955 bcd	21.9 bcd	15.2	589
Dibrom 8+ Eminent 125SL	1 pt 13 oz	5810 bcd	21.8 bcd	15.0	558
Lorsban 4E	0.5 pt	5388 cd	19.7 cd	15.5	536
Lorsban 4E + Eminent 125SL	1 pt 13 oz	5300 d	19.5 d	15.3	523
LSD (0.10)	--	1205	3.9	NS	--

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