INSECTICIDAL SEED TREATMENTS AND ROUNDUP/FOLIAR INSECTICIDE TANK-MIXTURES: IMPACTS ON SUGARBEET PLANT HEALTH AND YIELD

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Introduction:

Several new crop protection materials have recently received federal registration for use in sugarbeet. These new sugarbeet production tools include seed treatment insecticides such as Cruiser 5FS, NipsIt Inside, and Poncho Beta, and glyphosate (e.g., Roundup) herbicide. A substantial amount of research has been conducted on the pest control capability of these materials, and most of that testing was carried out in the presence of either weed or insect pests. However, little is known regarding the impacts of these new crop protection materials on sugarbeet plant health and resulting yield parameters is not yet well understood. These trials were carried out in the absence of insect or weed pressure to determine whether any impacts, either positive or deleterious, would be likely from the use of these materials

Materials and Methods:

Methods common to both studies: 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. All experiments were arranged in a randomized complete block design with four replications. Yield data were collected by harvesting both rows of each plot with a 2-row mechanical harvester. Subsamples of 12-18 harvested beets were sent to the American Crystal Sugarbeet Tare Laboratory (East Grand Forks, MN) for quality analyses. All data was subjected to analysis of variance (ANOVA) using the general linear models (GLM) procedure (SAS Institute, 1999), and treatment means were compared using Fisher's protected least significant difference (LSD) test at a 0.05 level of significance.

Study I: *Yield impacts of tank-mixed sprays containing Roundup herbicide with a foliar liquid insecticide.* This study was planted with BTS 86RR66 seed on 2 June at a field site near Hillsboro, ND. Each plot was established with one pass of the 6-row planter, but treatment applications and evaluations were conducted on the four inner rows of each plot. The outer rows of each plot served as a buffer between adjacent plots. All plots, including the check, received a planting-time application of Counter 15G at a low (8 lb product /ac) rate in 5-inch bands to prevent unwanted impacts from secondary pests such as springtails, wireworms, or white grubs. In addition to the untreated check, which was hand-weeded and did not receive Roundup, the study also included a Roundup-only control. This preventative application was made because the focus of the experiment was on impacts of the tank-mixed postemergence combinations.

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 2 July by using a tractor-mounted CO_2 spray system that delivered a finished spray volume of 10 GPA using TeeJet 11001VS nozzles. This study was harvested on 23 September, 2009.

Study II: *Impacts of seed treatment insecticides on plant health/yield of Roundup-Ready sugarbeet.* This study was planted with BTS 86RR66 seed on 2 June at a field site near Hillsboro, ND, and at a second location near Foxhome, MN on 15 June. Plots were two rows (22-inch spacing) wide and 35 feet long, and 25-foot tilled alleys between replicates were maintained weed-free throughout the growing season. This experiment consisted of three insecticidal seed treatments, which included Cruiser 5FS (60 g a.i./100,000-seed unit), Poncho Beta(60 g clothianidin + 8 g a.i. betacyfluthrin/unit), and Nipsit Inside (60 g a.i./unit). Counter 15G was used at moderate (10 lb) and high (11.9 lb product/ac) application rates to serve as industry standard treatments in the experiment. All treatments were compared with an untreated check for yield and quality. The Hillsboro location was harvested on 23 September, and the Foxhome site was harvested on 14 October, 2009.

Results and Discussion:

Yields from all treatments in this trial were generally very good, and all resulted in excellent levels of gross economic return. There were no significant differences between any of the treatments with regard to recoverable sucrose yield, root tonnage, or percent sucrose (Table 1). Additionally, there were no obvious trends relating to tank-mixing of either insecticide with Roundup herbicide. Therefore, these findings suggest that there are no significant yield impacts, either negative or positive, from these tank-mixed combinations. This work should be carried out for at least one additional growing season to determine the consistency of these preliminary findings.

Table 1. Sugarbeet yield and quality impacts from tankmixed combinations containing Roundup and postemergence liquid insecticides, Hillsboro, 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)
Lorsban 4E + Roundup Original Max	Post Broadcast	2 pts 1 qt	1.0 1.13	7775 a	26.2 a	15.93 a	933
Roundup Original Max	Post Broadcast	1 qt	1.13	7710 a	25.7 a	16.13 a	938
Vydate C-LV + Roundup Original Max	Post Broadcast	34 fl oz 1 qt	1.0 1.13	7644 a	25.5 a	16.15 a	930
Check	-----	----	-----	7470 a	25.5 a	15.83 a	884
Lorsban 4E	Post Broadcast	1 pt	0.5	7427 a	25.3 a	15.88 a	880
Lorsban 4E	Post Broadcast	2 pts	1.0	7375 a	26.2 a	15.40 a	827
Lorsban 4E + Roundup Original Max	Post Broadcast	1 pt 1 qt	0.5 1.13	7327 a	24.8 a	15.93 a	876
Vydate C-LV	Post Broadcast	17 fl oz	0.5	7292 a	25.9 a	15.85 a	862
Vydate C-LV + Roundup Original Max	Post Broadcast	17 fl oz 1 qt	0.5 1.13	7275 a	24.2 a	16.15 a	888
Vydate C-LV	Post Broadcast	34 fl oz	1.0	7096 a	24.1 a	15.93 a	841
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).

Yield data from the no-pest seed treatment study at Hillsboro are presented in Table 2. Excellent yields and economic returns were achieved by all entries in the experiment at this location, and there were no statistical differences between seed treatments. Additionally, none of the seed treatment plots differed significantly from the untreated check with regard to recoverable sucrose or root yield. Percent sucrose from plots that received Counter 15G at either 10 or 11.9 lb product/ac was significantly lower than that from the untreated check plots. Counter-treated plots also had significantly lower percent sugar than the NipsIt plots.

Table 2. Impacts of insecticidal seed treatments on sugarbeet yield and quality in the absence of insect pressure (Study II), Hillsboro, 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)
Poncho Beta	Seed		68 g a.i./ unit seed	7874 a	27.0 a	15.78 ab	923
Counter 15G	B	10 lb	1.5	7395 a	26.1 a	15.35 b	836
Check	---	----	---	7348 a	24.7 a	16.05 a	886
Counter 15G	B	11.9 lb	1.8	7278 a	25.7 a	15.43 b	821
Cruiser	Seed		60 g a.i./ unit seed	7134 a	23.9 a	16.00 a	861
NipsIT Inside	Seed		60 g a.i./ unit seed	7080 a	24.5 a	15.63 ab	822
LSD (0.05)				NS	NS	0.49	

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; Seed = insecticidal seed treatment

Results from the Foxhome location of this trial support our findings from Hillsboro. Yields at Foxhome were respectable for all treatments. There were no significant differences in yield parameters between treatments, irrespective of whether a seed treatment or planting-time granule was used, and none of the insecticide entries differed from the untreated check. Contrary to the results at Hillsboro, there were no differences between treatments with respect to percent sucrose.

The combined findings from the two seed treatment study sites therefore suggest that seed treatment insecticides are unlikely to cause any deleterious effects on yield or quality of Roundup-Ready sugarbeet. This study also should be repeated to confirm these preliminary findings.

Table 3. Impacts of insecticidal seed treatments on sugarbeet yield and quality in the absence of insect pressure (Study II), Foxhome, MN, 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	B	10 lb	1.5	6025 a	22.1 a	14.98 a	644
NipsIT Inside	Seed		60 g a.i./ unit seed	5878 a	21.7 a	14.88 a	622
Check	---	----	---	5759 a	21.2 a	14.95 a	614
Poncho Beta	Seed		68 g a.i./ unit seed	5660 a	20.8 a	14.88 a	600
Counter 15G	B	11.9 lb	1.8	5654 a	20.7 a	14.95 a	604
Cruiser	Seed		60 g a.i./ unit seed	5606 a	20.8 a	14.83 a	589
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] B = band; Seed = insecticidal seed treatment

Reference Cited:

SAS Institute. 1999. SAS/STAT user's guide for personal computers, version 8.0. SAS Institute, Inc., Cary, NC.