

FIELD STRIP TRIAL EVALUATION OF SEED TREATMENT INSECTICIDES IN THE RED RIVER VALLEY

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ABSTRACT

Sugarbeet growers in the Red River Valley are at constant risk of plant stand losses and corresponding yield reductions caused by one (or more) soil-dwelling pests. To date, these pests have been managed by the widespread use of both conventional liquid and granular insecticide formulations. Because of their convenience and relative level of application safety, insecticidal seed treatments have gained immense popularity among sugarbeet producers in the Red River Valley over the past two years. Poncho Beta was used on 65% of American Crystal Sugar Company's acreage in its first year of use. Strip trials were carried out during the 2010 growing season to compare the efficacy of commercially available insecticidal seed treatments, and as well as conventional insecticides, against the following: sugarbeet root maggot, (*Tetanops myopaeformis*); wireworms (*Limonius* spp.); springtails (Collembola spp.) and white grubs (*Lachnosterna* spp.). Each strip trial was conducted utilizing standardized agronomic and pest management production practices and were all located in contracted commercial fields. Established stand counts taken across all trials revealed that the insecticidal seed treatments may be less likely to cause stand losses due to phytotoxicity than conventional insecticides and consistently trended higher counts than the check in each respective trial. In trials with heavy root maggot pressure, Counter 15G treatments had the highest recoverable sugar per acre and the insecticidal seed treatments performed better than the untreated checks. All insecticidal seed treatments gave increased recoverable sugar per acre at one springtail location compared to the untreated check and NipsIt and Poncho Beta treatments also increased recoverable sugar per acre at a second springtail site. This data indicates the insecticidal seed treatments evaluated in these strip trials are likely to provide similar levels of root protection from the above targeted pests as the conventional liquid and granular insecticides, but usually provide inadequate protection from serious infestations of root maggots.

Insecticidal seed treatments made their commercial debut in 2009 with the commercial launch of Poncho Beta. Attracted by its convenience (no specialized application equipment is required nor is any calibration necessary to achieve the targeted application rate) and application safety (lower risk of chemical exposure), sugarbeet producers in the Red River Valley used Poncho Beta on 29% of the total sugarbeet acreage planted during its first year of use alone. That percentage increased to 36% during the 2010 growing season. This had a dramatic impact on granular-formulated insecticides, such as Counter 15G[®], whose usage dropped from 43% in 2008, to 19% in both 2009 and 2010, respectively.

Since the mode of action portfolio of commercially-available insecticides utilized in the Red River Valley has increased dramatically with the introduction of the insecticidal seed treatments, a series of commercial-size strip trials were designed to support and compare previous data published from university trials of the same nature. The strip trials were conducted up and down the valley to compare several commonly used and experimental insecticidal seed

treatments against a wide range of target pests including, sugarbeet root maggot, wireworm, springtail, and white grub, each specific to their respective trial location.

Materials and Methods:

During the 2010 growing season, plots were established within commercial fields located near St Thomas, Grafton, Minto and Amenia, ND and Eldred and Beltrami, MN (contracted to American Crystal Sugar Company) and near Foxhome, MN (contracted to Minn-Dak Farmers Cooperative). Each site was located in an area specific to a target pest; sugarbeet root maggot, (*Tetanops myopaeformis*); wireworm (*Limonius* spp.); springtail (*Collembola* spp.) and white grub (*Lachnosterna* spp.).

Regular Pellet-sized Crystal 539 was commercially treated with Poncho Beta[®] (Clothianidin + beta-Cyfluthrin), Cruiser 5FS[®] (Thiamethoxam) and NipsIt Inside[®] (Clothianidin), respectively. All seed contained standardized treatments of Apron[®] (Metalaxyl) and Thiram[®] (Thiram). Cooperating growers planted each trial utilizing their own equipment and adhered to sowing practices accepted as industry standards by both Cooperatives. Each of the respective seed treatments was planted into multiple strips within the commercially contracted fields (replicated in several trials) spanning the length of the field. Counter 15G[®] (Terbufos) was applied in-furrow at several locations including the sugarbeet root maggot sites. The plots were maintained throughout the growing season by each of the cooperating growers where herbicides, additional insecticides and fungicides were applied as necessary for each individual location. Stand counts were taken (4 areas per replication) at 15 and 30 days after planting. Root damage ratings (0-5 scale, 0=No Scars, 5=More than 80% of the root area blackened, an obviously damaged or dead beet) were conducted by the North Dakota State University Entomology Department (4 areas of 10 roots per replication per strip) on locations specific to sugarbeet root maggot. All locations were evaluated on yield performance relative to their respective seed treatment.

Each strip was individually harvested by the cooperating grower under the supervision of a company agriculturist and adhered to harvest practices accepted as industry standards in the Red River Valley. In order to reduce the effects of bordering plots, only beets in the center 2 rows were collected for quality and yield analysis. Three areas of 10 roots per replication per strip were bagged and transported to the American Crystal Sugar Company Tare Lab (East Grand Forks, MN) for quality and purity analysis. The White Grub location was processed at the Minn-Dak Farmers Cooperative Tare Lab (Wahpeton, ND). All samples were rated for root yield, percent tare, sugar content, and impurity level (sugar loss to molasses).

Results and Discussion:

The locations targeting sugarbeet root maggot had infestations ranging from light to extreme. Since each location was maintained throughout the growing season by each of the cooperating growers, additional insecticides were applied as necessary with two locations receiving a post-emerge application of Lorsban 4E applied during peak fly activity for additional control. When root maggot damage ratings were performed, it was found that Cruiser 5FS, NipsIt Inside, and Poncho Beta decreased damage on the roots compared to the untreated checks (Figure 1). NipsIt Inside and Cruiser 5FS increased recoverable sugar per acre by 774 pounds and 960 pounds, respectively. This sugar increase exhibited by the two seed treatment

insecticides equates to an increased revenue of \$136 (NipsIt Inside) and \$186 (Cruiser 5FS) per acre. Across all maggot-targeted locations, Counter 15G applied in-furrow increased recoverable sugar by an average of 1,518 pounds (\$267 revenue) per acre. This data corresponds well with numerous university studies confirming Counter 15G, applied modified in-furrow, as one of the most effective insecticidal treatments against sugarbeet root maggot commercially available to producers in the Red River Valley (Table 1). It is worthy to note that excessive rain amounts may have had more impact on recoverable sugar per acre and revenue per acre than product performance (St. Thomas locations received 24.21 inches of rain from May through September).

The springtail location in Beltrami, MN had uniform springtail damage across the entire site where the Amenia, ND location appeared to have the heaviest infestations isolated to pockets within the Cruiser 5SF replications, thus causing significant stand losses and further loss of revenue (NipsIt Inside and Poncho Beta increased revenue by about \$25 per acre while the Cruiser 5FS application didn't increase recoverable sugar per acre or revenue per acre). Stand counts began to decrease at 15 days after planting and continued a downward trend at the thirty-day count as the insect pressure increased. Nevertheless, counts that were taken at 30 days post-planting for the treated replications at all locations showed an improvement over the untreated checks (Figure 2). This increase was approximately the amount to cover the cost of the application of the seed treatment insecticides.

The wireworm and white grub locations had very little to no insect pressure. Nevertheless, the tested locations were taken to harvest and evaluated accordingly. The results indicated that Nipsit Inside and Poncho Beta increased stands by 13.3% and 6.1% while Cruiser 5SF had a similar stand compared to the check (Figure 3). Counter 15G increased stands an average of 8.6%. Poncho Beta revealed an increase in revenue of about \$20 per acre over the untreated check and Nipsit Inside was similar to the untreated check. Cruiser 5FS didn't increase revenue. In this particular low pressure situation the additional cost of the insecticidal seed treatment didn't offer a financial benefit to the grower.

Overall, established stand counts taken across all trials revealed that the insecticidal seed treatments may be less likely to cause stand losses due to phytotoxicity than the conventional insecticides and consistently trended higher counts than the check in each respective trial (Table 2). However, a reduced emergence effect has been observed for many types of industry seed treatments, both those that do and do not involve seed pelleting. In trials with heavy root maggot pressure, Counter 15G treatments had the highest recoverable sugar per acre and the insecticidal seed treatments performed better than the untreated checks. NipsIt Inside and Poncho Beta showed a tendency to increase revenue overall, but it wasn't enough to cover the additional cost of the treatment compared to the non-treated check. Cruiser 5FS didn't numerically increase revenue in this test (variation may have been impacted by strip location within the fields). This data indicates the insecticidal seed treatments evaluated in these strip trials are likely to provide similar levels of root protection from the above targeted pests as the conventional liquid and granular insecticides, but usually provide inadequate protection from serious infestations of sugarbeet root maggots.

FIGURES & TABLES:

Insecticide	Performance Rating		
	Root Maggot	Springtails	Wireworms
Counter 15G	Excellent	Excellent	Good
Cruiser 5FS	Fair	Good	Good
NipsIt Inside	Fair	Good	Good
Poncho Beta	Fair	Good	Good

Table 1. Performance rating of insecticides for control of various sugarbeet insect pests in NDSU trials in the Red River Valley 2006 - 2009 (Dr. M. Boetel, NDSU Entomology Dept.)

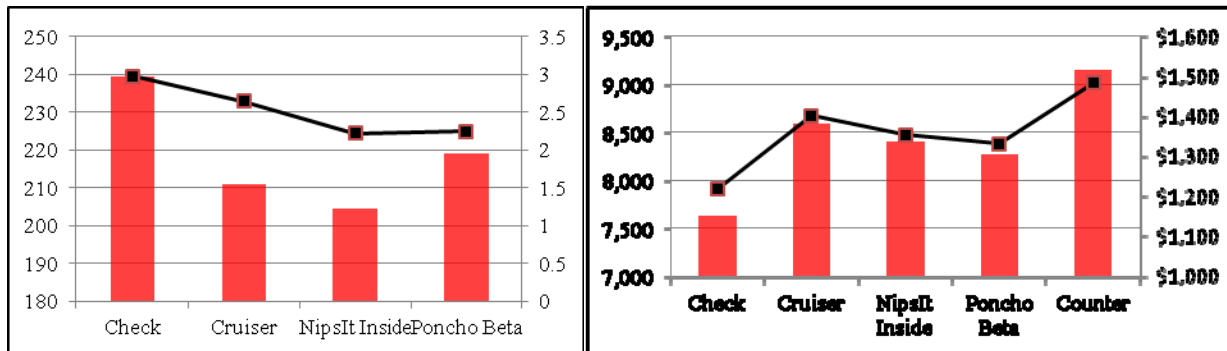


Figure 1. Sugarbeet Root Maggot Data - Established stand of sugarbeet (collected 30-days post-planting) and damage ratings from sugarbeet root maggot locations (higher numbers equate greater damage severity). Recoverable sugar per acre and revenue per acre are expressed in pounds per acre and dollars per acre, respectively.

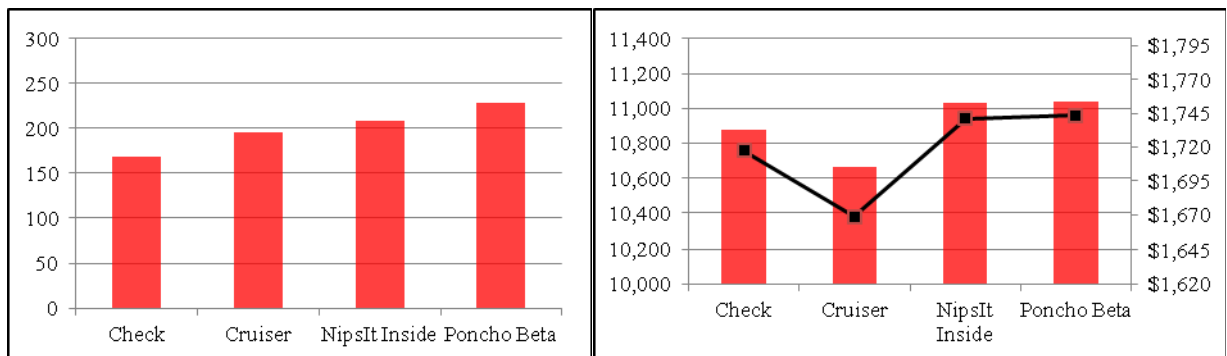


Figure 2. Springtail Data - It is noteworthy to indicate that all three seed treatments tested increased stand from 30-60 plants per one hundred foot of row compared to the untreated check and that NipsIt Inside and Poncho Beta treatments also increased recoverable sugar per acre and revenue per acre across both locations.

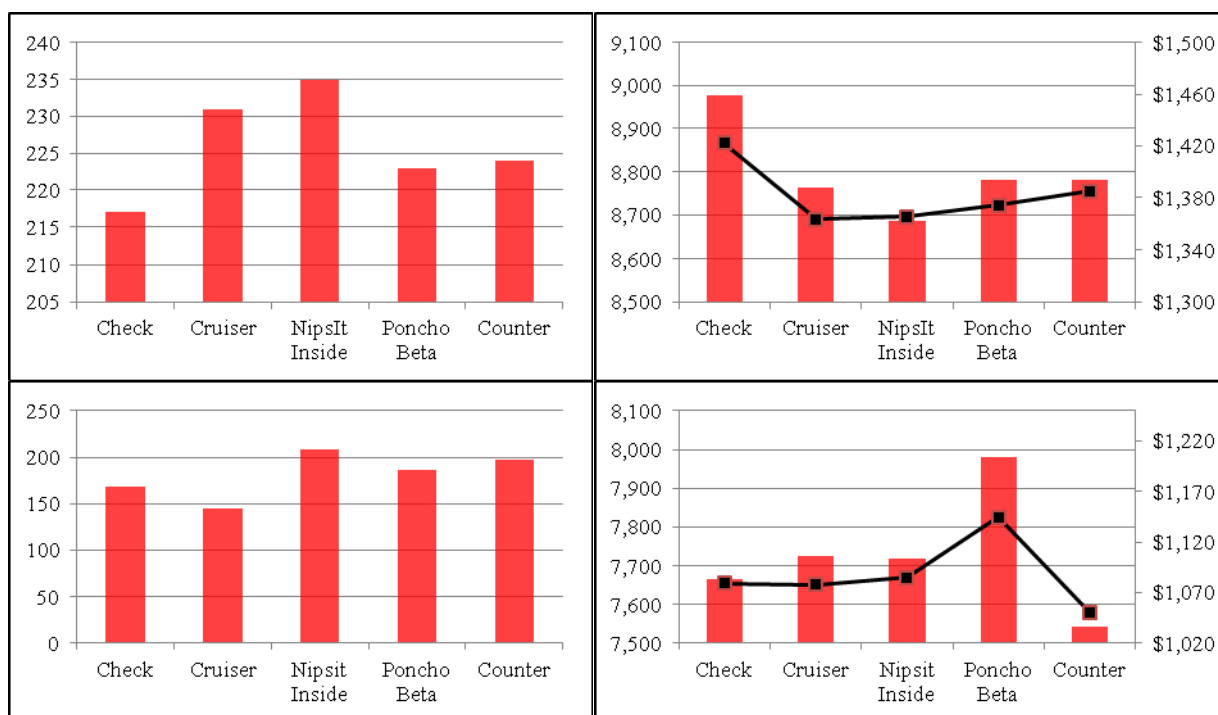


Figure 3. Wireworm (Top) & White Grub Data (Bottom) - The wireworm and white grub locations offered very little to no insect pressure and as a result, the additional cost of the seed treatment didn't offer a financial benefit to the grower(s).

	Check	Cruiser 5FS	NipsIt Inside	Poncho Beta
Stand	200	211	203	221
Recoverable Sugar per Acre	9,004 lbs.	8,948 lbs.	9,169 lbs.	9,039 lbs.
Revenue per Acre	\$1,398	\$1,394	\$1,423	\$1,411

Table 2. Overall results of all the trials combined.

Selected References:

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Acknowledgements:

Sugarbeet Root Maggot Locations:

- Kennelly Farms – St. Thomas, ND
- Kevin Lee – St. Thomas, ND
- Rod Shanilec – Minto, ND
- Scott Hulst – Grafton, ND

Springtail Locations:

- Dave & Andrew Johnstad - Beltrami, MN
- Bill & John Hejl – Amenia, ND

Wireworm Location:

- Lee, Bradley & Delano Thoreson – Eldred, MN

White Grub Location:

- Fred & Mike Hansen – Foxhome, MN

Cooperators:

- Robert Dregseth – NDSU Entomology Dept.
- Crystal Beet Seed
- Germain's Seed Technology
- Bayer CropScience
- Syngenta Crop Protection
- Valent U.S.A.