On-Farm Evaluation of Seed Applied Nematicides on Soybean

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Introduction

The soybean cyst nematode (SCN) is one of the major soybean yield robbers in Iowa. About 0.7 million tons of soybean were likely lost due to SCN in Iowa in 2014 alone.

The primary management of SCN is to use resistant soybean varieties, but several chemical and biological nematicidal seed-treatment products were introduced in recent years. They give farmers more options for managing SCN. Avicta and ILeVO are two of the primary chemical nematicides. Clariva, VOTiVO and N-HIBIT are some of the biological nematicides available on the market.

Clariva contains *Pasteuria nishizawae* bacteria, which are parasitic to nematodes. The active ingredient of ILeVO is fluopyram, which protects soybean against *Fusarium virguliforme,* the causal organism of sudden death syndrome, and kills nematodes in the seed zone.

The objective of this study was to evaluate the efficacy of Clariva and ILeVO seed treatments to control SCN and reduce soybean yield losses from SCN.

Methodology

On-farm replicated strip trials were conducted by farmers working with the Iowa Soybean Association On-Farm Network and small-plot experiments were conducted by Iowa State University researchers in 2014 and 2015.

Clariva Treatments:
1. Clariva Complete Beans (Clariva) – the base seed treatment is CruiserMaxx Advanced plus Vibrance
2. CruiserMaxx Advanced plus Vibrance (CruiserMaxx)

ILeVO Treatments:
1. Acceleron plus Poncho/VOTiVO plus ILeVO (ILeVO)
2. Acceleron plus Poncho/VOTiVO (Acceleron)

The seed treatments were applied to SCN (PI88788) resistant or moderately resistant soybean varieties.

In 2014,15 on-farm Clariva trials were located in the northern half of Iowa and 9 small-plot experiments were spread across Iowa (Fig 1). In 2015, 19 on-farm trials and 9 small-plot experiments tested ILeVO in 2015. Small-plot experiments were a complete randomized block design with 12 replications and the on-farm strip trials were replicated at least 4 times.

For strip trials, soil sampling for SCN counts was done in early-summer, mid-summer and at harvest in 2014 and in early summer and at harvest in 2015. For small-plot experiments, soil samples were collected at planting, mid-season, and harvest. Georeferenced yield data were collected for the on-farm strip trials. Small-plot combines were used in the small-plot experiments.
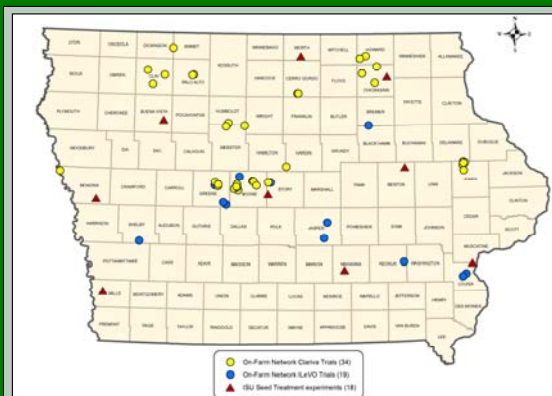

Figure 1: Trial locations for Clariva and ILeVO in 2014 and 2015. The small-plot experiments were established in the same locations in 2014 and 2015.
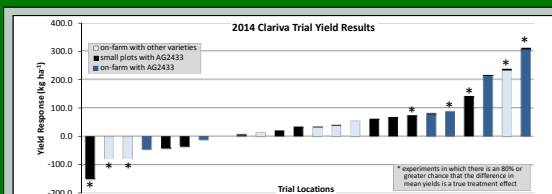
Legend:
- On-Farm Network Clariva Trials (34)
- On-Farm Network ILeVO Trials (19)
- ISU Seed Treatment experiments (18)

Figure 2: In 2014, Clariva had an average yield response of 40 kg ha^{-1} (0.6 bu/A) across all locations. Five of the 24 locations had a significant yield increase (*).
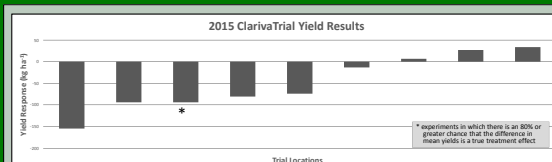

Figure 3: In 2015, Clariva had an average yield response of -49 kg ha^{-1} (-0.7 bu/A) in the small-plot experiments.
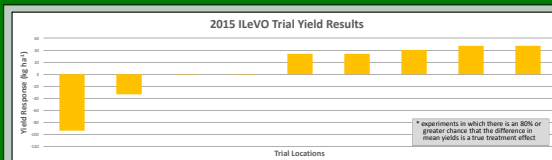

Figure 4: In 2015, ILeVO had an average yield response of 8 kg ha^{-1} (0.1 bu/A) in the small-plot experiments. None of the locations had a significant yield response.

Experiment Location	"Clariva" RF	"CMxV" RF	"Clariva" RF minus "CMxV" RF	% chance difference due to treatment
Northwest	1.35	2.07	-0.72	43%
North Central	6.8	7.44	-0.64	33%
Northeast	0.72	0.53	0.19	83%
West Central	1.07	1.8	-0.73	85%
Central	2.24	2.08	0.16	16%
East Central	0.72	1.85	-1.13	97%
South West	0.54	0.36	0.18	82%
South Central	0.95	0.59	0.36	57%
Southeast	5.94	8.05	-2.11	86%
Overall Mean	**2.26**	**2.75**	**-0.49**	**92%**

Figure 5: There was a significant reduction of reproduction of SCN (49%) with Clariva across the 2014 ISU small-plot locations.

SCN reproductive factor (RF) = # SCN eggs in a plot end of season / # SCN eggs in a plot beginning of season

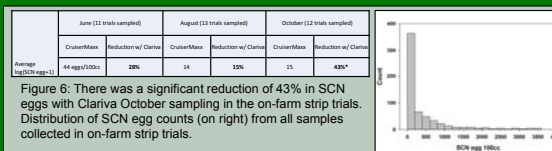|	June (11 trials sampled)		August (13 trials sampled)		October (12 trials sampled)	
	CruiserMaxx	Reduction w/ Clariva	CruiserMaxx	Reduction w/ Clariva	CruiserMaxx	Reduction w/ Clariva
Average log(SCN eggs)/100cc	44 eggs/100cc	28%	14	15%	15	43%*

Figure 6: There was a significant reduction of 43% in SCN eggs with Clariva October sampling in the on-farm strip trials. Distribution of SCN egg counts (on right) from all samples collected in on-farm strip trials.
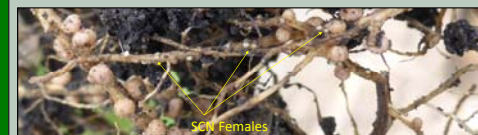

Figure 7: The soybean cyst nematode females are the small white lemon shaped objects (cysts) attached to the soybean root.

Results

Clariva: In 2014, the average yield difference between Clariva and CruiserMaxx treatments was 13.5 kg ha^{-1} (90% confidence interval (CI) from -40 to 74 kg ha^{-1}) across small-plot trials and 53.5 kg ha^{-1} (90% CI from 21 to 94 kg ha^{-1}) across on-farm strip trials. For the combined dataset of two types of trials, Clariva produced a relatively small but significant yield increase of 40 kg ha^{-1} (90% CI from 5 to 72 kg ha^{-1}) (Fig. 2).

A significant reduction of 49% in season-long SCN reproduction comparing beginning- and end-of-season SCN soil population densities associated with Clariva vs CruiserMaxx was observed in small-plot trials (Fig. 5). Likewise in the on-farm strip trials there was a significant decrease in SCN eggs by 43% at the last sampling date (Fig. 6). A greater yield did not always occur with Clariva in locations where significant reductions in SCN reproduction were detected.

In 2015, the average yield difference between Clariva and CruiserMaxx treatments was -49.3 kg ha^{-1} (90% CI from -87 to -10 kg ha^{-1}) across the small-plot experiments (Fig. 3).

ILeVO: In 2015, the average yield difference between ILeVO and Acceleron treatments was 8.2 kg ha^{-1} (90% CI from -36 to 52 kg ha^{-1}) across the small-plot experiments (Fig. 4).

The SCN data for all 2015 trials and the yield data from the on-farm trials are still being collected or analyzed at the time of this meeting.

Conclusions

In 2014, Clariva nematicide seed treatments decreased SCN reproduction in both on-farm trials and small-plot experiments. A small but significant soybean yield response of 40 kg ha^{-1} to Clariva was observed only across on-farm trials.

With some available data in 2015, yields with Clariva treatments were significantly lower by 49 kg ha^{-1} across small-plot experiments. ILeVO seed treatments did not increase yield.

Acknowledgments