

On-farm Corn Rootworm Trials

RFR-A1312

The use of corn rootworm (CRW) transgenic traits in corn hybrids has allowed farmers to manage CRW without using soil-applied insecticides. However, rootworm populations resistant to some of the transgenic traits have been confirmed in Iowa, leading some farmers to see if there is an economic return by adding an insecticide when planting CRW-Bt corn.

Methods

Eight CRW trials were conducted in Lyon, Sioux, Clay, Monona, Crawford, and Hancock counties in 2013 (Table 1). Some trials compared a CRW-Bt hybrid with and without an insecticide, and others also included a non-Bt hybrid with and without an insecticide (Table 2). In Trials 1, 3, and 7, Pioneer Herculex® hybrids were used. A non-Bt Pioneer hybrid (987HR) was included in Trial 7. In Trial 2, hybrids utilizing the Agrisure® genetics were used and compared with a non-Bt hybrid (NK 53W). In Trial 4, two VT3 hybrids were used containing a refuge hybrid in the bag (PRIB). In Trials 5, 6, and 8, SmartStax® genetics were used. The hybrid in Trial 8 contained a refuge hybrid in the bag (RIB). All trials were conducted in fields that were planted to corn in 2012.

The insecticides used in Trials 1, 4, 5, 6, and 8 were Aztec 2.1 or Aztec 4.67G. Force 3G was used in Trial 2 and Capture 2EC was used in Trials 3 and 7. All insecticides were applied in furrow. Trial 3 investigated using a starter fertilizer with and without Capture insecticide. Five plants per plot were dug in each trial and the roots assessed for CRW larval injury on the 0–3 node injury scale, with 0 as no damage and 3 as three nodes of roots eaten.

Results

The root ratings indicated that the rootworm pressure was fairly low in most of the trials, with the exception of Trials 4 and 8, where one treatment exceeded the rating of 0.25 (a quarter node of roots eaten), which is often considered to be the economic threshold (Table 2). Even though there was little evidence of rootworm feeding in Trial 5, there was a significant yield increase of about 10 bushels/acre when Aztec was used with the SmartStax® hybrid. There also was a near statistically significant increase in yield with the addition of the insecticide to the CRW-Bt hybrids in Trials 3 and 6, where there also was very little rootworm feeding. This may indicate there was some benefit to the insecticide controlling other soil insects in these trials.

There was slightly less rootworm feeding with the insecticide treatment in Trial 1, but this did not result in a yield increase. The addition of the insecticide did not improve yields with any of the hybrids in Trial 2, although NK 53W 3000GT (Agrisure®), both with and without an insecticide, did yield significantly better than NK 53W 3122 (Agrisure® stack) without an insecticide. The addition of the insecticide did not improve the yields of the CRW-Bt hybrids in Trials 4 or 8. In Trial 7, the Herculex® hybrid yielded significantly more than the non-Bt hybrid, both with and without an insecticide, but the addition of an insecticide did not improve the yields of either hybrid. Based on these trials, it is apparent the addition of an insecticide to a CRW-Bt hybrid may occasionally result in a yield increase, but increase may or may not be due to the increased control of corn rootworms.

For more information on CRW and current research, contact Erin Hodgson, ISU Extension entomologist, (ewh@iastate.edu) or find the following links for CRW reference materials:

Yellow Book Summaries and Interactive Node Injury Scale:

www.ent.iastate.edu/dept/faculty/gassmann/rootworm

CRW management publication:

www.ent.iastate.edu/dept/faculty/hodgson/files/ul/CRW%20management%202012%20final.pdf

OR search keywords of rootworm, resistance, Bt corn, Iowa State University.

Table 1. Row spacing, planting date, population, previous crop, and tillage in corn rootworm trials.

Exp. No.	Trial	County	Row spacing (in.)	Planting date	Planting population (seeds/A)	Previous crop	Tillage
130122	1	Lyon	22	5/18/13	38,500	Corn	Spring field cultivate
130147	2	Sioux	30	5/14/13	32,900	Corn	Spring disk
130205	3	Clay	30	5/13/13	35,000	Corn	Conventional
130318	4	Monona	30	5/12/13	32,500	Corn	Conventional
130319	5	Monona	38	5/16/13	31,000	Corn	Spring disk
130320	6	Monona	30	5/15/13	32,316	Corn	No-till
130321	7	Crawford	30	5/14/13	29,500	Corn	No-till
130405	8	Hancock	30	5/13/13	35,000	Corn	Conventional

Table 2. Treatments, root feeding, and yield in corn rootworm trials.

Exp. No.	Trial	Treatments	Insecticide (Y/N)*	Root injury rating**	Yield (bu/A)**	P-Value
130122	1	Pioneer 0062 AMX RIB (Herculex®)	Y	0.06 a	198.8 a	0.73
		Pioneer 0062 AMX RIB (Herculex®)	N	0.16 b	199.3 a	
130147	2	NK 53W 3000GT (Agrisure®)	Y	0.01 c	214.4 a	<0.01
		NK 53W 3000GT (Agrisure®)	N	0.04 bc	210.7 ab	
		NK 53W 3122 (Agrisure® stack)	Y	0.01 c	205.0 bc	
		NK 53W 3122 (Agrisure® stack)	N	0.02 c	197.9 c	
		NK 53W3 (non-Bt)	Y	0.11 ab	207.2 ab	
		NK 53W3 (non-Bt)	N	0.18 a	202.8 bc	
130205	3	Pioneer 528AMX (Herculex®)	N	0.11 a	197.6 a	0.08
		Pioneer 528AMX (Herculex®) + 4 gal/A 6-24-6 starter fertilizer	N	0.10 a	197.4 a	
		Pioneer 528AMX (Herculex®) + 4 gal/A 6-24-6 starter fertilizer	Y	0.10 a	202.1 a	
130318	4	LG2620 (VT3 PRIB)	Y	0.01 b	232.7 a	0.03
		LG2602 (VT3 PRIB)	Y	0.08 ab	226.9 ab	
		LG2602 (VT3 PRIB)	N	0.36 a	219.9 b	
		LG2620 (VT3 PRIB)	N	0.13 ab	230.2 ab	
130319	5	DK 6333SSLL (SmartStax®)	Y	0.01 a	222.2 a	<0.01
		DK 6333SSLL (SmartStax®)	N	0.05 a	212.3 b	
130320	6	Renze seeds 3240SST (SmartStax®)	Y	0.01 a	145.9 a	0.06
		Renze seeds 3240SST (SmartStax®)	N	0.03 a	130.9 a	
130321	7	Pioneer 987HR (non-Bt)	Y	0.01 a	178.8 b	<0.01
		Pioneer 987AM1 (Herculex®)	Y	0.01 a	187.4 a	
		Pioneer 987AM1 (Herculex®)	N	0.03 a	188.9 a	
		Pioneer 987HR (non-Bt)	N	0.05 a	176.1 b	
130405	8	DKC 53-78 RIB (SmartStax®)	Y	0.16 a	205.1 a	0.24
		DKC 53-78 RIB (SmartStax®)	N	0.43 a	198.5 a	

*Aztec 4.67G (2 oz/1,000 ft of row) was used in Trial 1, Force (5 oz/1,000 ft of row) in Trial 2, Capture @ 8 oz/A in Trial 3, Aztec 4.67G @ 3 lb/A in furrow in Trial 4, Aztec 2.1G (3.8 lb/A^{-3/4} rate) in furrow in Trial 5, Aztec 2.1G at 7.3 lb/A in furrow (full rate) in Trial 6, Capture 2EC at 7.5 oz/A in furrow in Trial 7, and Aztec 2.1G @ 6.7 oz/1,000 ft of row in furrow in Trial 8.

**Values denoted with the same letter within a trial are not statistically different at the significance level 0.05.