On-Farm Corn Rootworm Management Demonstration Trials

RFR-A1839

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Introduction

Corn rootworm is a persistent and economically important pest in Iowa. Rotating corn with soybeans usually manages the pest, although rotation-resistant populations have occurred in some locations. As problems with corn rootworm resistance to Bt corn continues to be found in Iowa, it is important to research methods to manage this pest. The objective of these trials was to investigate various methods of managing corn rootworm.

Materials and Methods

In 2018, six trials investigating various methods of managing corn rootworm were conducted (Table 1). All trials were conducted on-farm by farmer cooperators using the farmer's equipment. Strips were arranged in a randomized complete block design with at least three replications per treatment. Strip width and length varied from field-to-field depending on field and equipment size. All strips were machine harvested for grain yield.

In Trials 1 and 6, a Smartstax hybrid was planted with and without Aztec® insecticide (Table 2). Agrigold 628-20 was used in Trial 1 and Pioneer P9929 was used in Trial 6. Both trials were on previous corn ground. In Trial 2, NK0650-3111, NK0650-GT, and NK0650-5222EZ1 were planted on corn ground with and without Force® insecticide. NK0650-3111 is a Bt3 hybrid, NK0650-GT is a conventional hybrid, and NK0650-5222EZ1 is a Smartstax hybrid. Root ratings were made in Trial 2 in late July using the Iowa State Node Injury (0-3) scale (Table 3). In Trials 3 and 4, Wyffels 4968SS, Wyffels 4966, and Wyffels 490 were planted with and without Aztec® insecticide. Wyffels 4968SS is a Smartstax hybrid, Wyffels 4966 is a VT2P hybrid, and Wyffels 490 is a conventional hybrid. Trial 3 was on corn ground and Trial 4 was on soybean ground. In Trial 5, Viking 13-07 and Viking 42-05 were planted with and without Aztec® insecticide on soybean ground. Both hybrids are conventional.

Results and Discussion

In Trials 1 and 6, there was no difference in corn yield with or without the rootworm insecticide, indicating the Smartstax Bt trait is giving sufficient control of any rootworms present in these fields (Table 2). In Trial 2, the conventional corn yielded 33 bushels/acre more with the use of an insecticide. The conventional corn had a root rating of 1.13 without an insecticide compared with 0.2 with the insecticide (Table 3). The insecticide did not improve the yield of either the Bt3 or Smartstax hybrids. However, root ratings indicated neither the Bt3 or Smartstax hybrids were providing complete control of the rootworms. This indicates rootworms in this field have some resistance to both Bt traits. The use of an insecticide improved the root rating of the Smartstax hybrid, but not the Bt3 hybrid. In Trial 3, the Smartstax hybrid with and without an insecticide yielded more than the conventional hybrid without an insecticide. The insecticide did not improve the yield of the conventional hybrid. In Trials 4 and 5, all hybrids with and without an insecticide yielded the same, indicating there were likely little, if any, rootworms present in these fields on soybean ground.

NOTE: The results presented are from replicated demonstration trials. Statistics are used to detect differences at a location and should not be interpreted beyond the single location.

Table 1. Variety, planting date, planting population, previous crop, and tillage practices in on-farm trials investigating corn rootworm management in corn in 2018.

Exp. no.	Trial	County	Variety	Row spacing	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
180102	1	Lyon	Agrigold 628-20	22	5/19/18	36,000	Corn	Conventional
180131	2	Sioux	NK0650-3111, NK0650-GT, NK0650-5222EZ1	30	5/18/18	34,000	Corn	Conventional
180412	3	Hancock	Wyffels W4868, W4966, and W4960	30	5/20/18	35,000	Corn	Conventional
180413	4	Hancock	Wyffels W4868, W4966, and W4960	30	5/18/18	35,000	Soybean	Conventional
180415	5	Hancock	Viking 13-07 and Viking 42-05	30	5/26/18	35,000	Soybean	Conventional
180141	6	Lyon	Pioneer P9929	22	5/19/18	36,000	Corn	Conventional

Table 2. Yields for on-farm corn rootworm management trials in 2018.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
180102	1	Agrigold 628-20 (Smartstax) with Aztec HC at 0.8 oz/1,000 ft of row	220 a	1.00
		Agrigold 628-20 (Smartstax) without insecticide	220 a	
180131	2	NK0650-3111 (Bt 3) without insecticide	184 ab	<0.01
		NK0650-3111 (Bt 3) with Force 3G at 14 lb/ac	189 ab	
		NK0650-GT (conventional) without insecticide	167 a	
		NK0650-GT (conventional) with Force 3G at 14 lb/ac	200 b	
		NK0650-5222EZ1 (Smartstax) without insecticide	188 ab	
		NK0650-5222EZ1 (Smartstax) with Force 3G at 14 lb/ac	204 b	
180412	3	Wyffels 4968SS (Smartstax) without insecticide	161 a	0.01
		Wyffels 4968SS (Smartstax) with Aztec 2.1 insecticide at 8 lb/ac	163 a	
		Wyffels 4966 (VT2P) without insecticide	152 ab	
		Wyffels 4966 (VT2P) with Aztec 2.1 insecticide at 8 lb/ac	158 ab	
		Wyffels 4960 (conventional) without insecticide	142 b	
		Wyffels 4960 (conventional) with Aztec 2.1 insecticide at 8 lb/ac	148 ab	
180413	4	Wyffels 4968SS (Smartstax) without insecticide	202 a	0.91
		Wyffels 4968SS (Smartstax) with Aztec 2.1 insecticide at 8 lb/ac	200 a	
		Wyffels 4966 (VT2P) without insecticide	200 a	
		Wyffels 4966 (VT2P)with Aztec 2.1 insecticide at 8 lb/ac	198 a	
		Wyffels 4960 (conventional) without insecticide	196 a	
		Wyffels 4960 (conventional) with Aztec 2.1 insecticide at 8 lb/ac	200 a	
180415	5	Viking 13-07 (conventional)	198 a	0.74
		Viking 13-07 (conventional) with Aztec 2.1 insecticide at 8 lb/ac	194 a	
		Viking 42-05 (conventional)	193 a	
		Viking 42-05 (conventional) with Aztec 2.1 insecticide at 8 lb/ac	194 a	
180141	6	Pioneer P9929 (Smartstax) with Aztec HC at 0.8 oz/1,000 ft of row	212 a	0.44
		Pioneer P9929 (Smartstax) without insecticide	215 a	

[a]Values denoted with the same letter within a trial are not statistically different at the significance level of 0.05.
[b]P-value = the calculated probability that the difference in yields can be attributed to the treatments and not other factors. For example, if a trial has a P-value of 0.10, then we are 90 percent confident the yield differences are in response to treatments. For P = 0.05, we would be 95 percent confident.

Table 3. Corn root ratings for Trial 2.

Exp. no.	Trial	Treatment	Root rating[ab]	P-value[c]
180131	2	NK0650-3111 (Bt 3) without insecticide	0.60 bc	<0.01
		NK0650-3111 (Bt 3) with Force 3G at 14 lb/ac	0.23 bc	
		NK0650-GT (Conventional) without insecticide	1.13 a	
		NK0650-GT (Conventional) with Force 3G at 14 lb/ac	0.20 bc	
		NK0650-5222EZ1 (Smartstax) without insecticide	0.68 ab	
		NK0650-5222EZ1 (Smartstax) with Force 3G at 14 lb/ac	0.15 c	

[a]Iowa State Node-Injury scale (0–3). Number of full or partial nodes completely eaten.
[b]Values denoted with the same letter within a trial are not statistically different at the significance level of 0.05.
[c]P-value = the calculated probability that the difference in root ratings can be attributed to the treatments and not other factors. For example, if a trial has a P-value of 0.10, then we are 90 percent confident the root rating differences are in response to treatments. For P = 0.05, we would be 95 percent confident.