On-Farm Corn and Soybean Variety Demonstration Trials

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Introduction
Farmers are faced with corn and soybean variety selection decisions each year as new varieties are introduced, including transgenic corn hybrids with several traits for insect and herbicide resistance. Recently, soybean varieties have been introduced with tolerance to the soybean aphid. As problems with corn rootworm resistance to Bt corn continue to be found in Iowa, it is important to research methods to manage this pest. The objective of these trials was to compare corn and soybean varieties on yield and/or insect tolerance.

Materials and Methods
In 2017, seven trials comparing two or more corn or soybean varieties were investigated (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 Trial 1, a soybean aphid tolerant variety was compared with a susceptible variety (Table 2). In Trials 2 and 3, a Smartstax hybrid was compared with a conventional hybrid, with and without Aztec® insecticide at

7.3 lb/acre. Trial 2 was on corn ground and Trial 3 was on soybean ground. In Trial 4, a soybean variety with a relative maturity of 2.4 was compared with a soybean variety with a relative maturity of 2.6. In Trial 5, a Roundup Ready® soybean variety was compared with a Liberty Link® and an Xtend® variety. A weed management program appropriate to each variety was used. In Trial 6, a Smartstax hybrid, a VT3 hybrid, and a conventional hybrid were compared in corn-on-corn ground with and without Force® insecticide at 4 oz/1,000 ft of row. Root ratings were made in Trial 6 in early August using the Iowa State Node Injury (0-3) scale (Table 3). In Trial 7, two corn hybrids were compared.

Results and Discussion
In Trial 1, the aphid tolerant soybean variety yielded five bushels/acre more than the susceptible variety (Table 2). The aphid population did not reach the economic threshold in either variety. In Trials 2 and 3, there was no difference in yield among the three varieties and no effect of the Aztec® insecticide on the corn yield. This likely means the population of corn rootworms and other soilborne insects was low in both fields. In Trial 4, there was no difference in yield between the two soybean varieties of differing maturities. In Trial 5, the Roundup Ready® variety yielded seven bushels/acre more than the Liberty Link® variety (P = 0.06), but yielded similar to the Xtend® variety. There was no difference in weed control with the three programs.

In Trial 6, there was about a 50-60 bushel/acre yield advantage to both of the hybrids with the Bt rootworm trait and to using the Force® rootworm insecticide on the conventional hybrid compared with the conventional hybrid without the insecticide. There was a yield increase of 20 bushels/acre with the Force®

rootworm insecticide on the VT3 hybrid compared with no insecticide, but not a significant yield advantage to using the Force® on the Smartstax hybrid.

There was a considerable amount of root feeding on all three hybrids without the insecticide (Table 3), with the conventional hybrid having the most feeding. There was significantly less root feeding in strips that received the Force® in all three hybrids. This indicates the Bt rootworm trait in both the

Smartstax and VT3 hybrids is no longer providing complete control of rootworms in this field. There was no difference in yield between the two corn hybrids in Trial 7.

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 varieties in corn and soybean in 2017.

Exp. no.	Trial	County	Variety	Row spacing	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
170117	1	Sioux	Organic Viking 0.2065 & 0.2188 aphid tolerant	30	5/16/17	165,000	Corn	Conventional
170402	2	Hancock	Wyffels 4960 & 4968	30	5/717	34,500	Corn	Conventional
170403	3	Hancock	Wyffels 4960 & 4968	30	5/9/17	34,750	Soybean	Strip till
170642	4	Pottawattamie	Asgrow 2433 and Asgrow 2636	20	4/25/17	155,000	Corn	No-till
170122	5	Osceola	Pioneer P22T10L, P22T73R, and P22T24X	30	5/13/17	140,000	Corn	Conventional
170131	6	Sioux	Syngenta N58S-5222, N58S-3111, & N58S-GT	30	5/9/17	34,000	Corn	Conventional
170501	7	Story	Becks 5828AMX and Middlekoop 9910	30	4/25/17	35,700	Corn	Conventional

Table 2. Yields for on-farm variety trials in corn and soybean in 2017.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
170117	1	Organic Viking 0.2188 (aphid tolerant)	69 a	<0.01
		Organic Viking 0.2065 (not aphid tolerant)	64 b	
170402	2	Wyffels 4968 SS (Smartstax)	301 a	0.64
		Wyffels 4968 with Aztec 2.1 at 7.3 lb/ac	300 a	
		Wyffels 4960 (Conventional)	307 a	
		Wyffels 4960 with Aztec 2.1 at 7.3 lb/ac	304 a	
170403	3	Wyffels 4968 SS (Smartstax)	251 a	0.39
		Wyffels 4968 with Aztec 2.1 at 7.3 lb/ac	249 a	
		Wyffels 4960 (Conventional)	255 a	
		Wyffels 4960 with Aztec 2.1 at 7.3 lb/ac	257 a	
170642	4	Asgrow Ag2433 (2.4 maturity)	59 a	0.91
		Asgrow Ag2636 (2.6 maturity)	59 a	
170122	5	Pioneer P22T10L (Liberty Link)	69 a	0.06
		Pioneer P22T73R (Roundup Ready)	76 a	
		Pioneer P22T24X (Xtend)	74 a	
170131	6	Agrisure N58S-5222 (SmartStax) with Force 3G T-band at 4 oz/1,000 ft of row	200 ab	<0.01
		Agrisure N58S-5222 (Smartstax)	189 b	
		Agrisure N58S-3111 (VT3) with Force 3G T-band at 4 oz/1,000 ft of row	212 a	
		Agrisure N58S-3111 (VT3)	192 b	
		Agrisure N58S-GT (Conventional) with Force 3G T-band at 4 oz/1,000 ft of row	190 b	
		Agrisure N58S-GT (Conventional)	140 c	
170501	7	Becks 5828AMX	193 a	0.83
		Middlekoop 9910	188 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 6.

Exp. no.	Trial	Treatment	Root rating[ab]	P-value[c]
170131	6	Agrisure N58S-5222 (SmartStax) with Force 3G T-band at 4 oz/1,000 ft of row	0.4 d	<0.01
		Agrisure N58S-5222 (Smartstax)	1.3 bc	
		Agrisure N58S-3111 (VT3) with Force 3G T-band at 4 oz/1,000 ft of row	0.6 cd	
		Agrisure N58S-3111 (VT3)	1.7 ab	
		Agrisure N58S-GT (Conventional) with Force 3G T-band at 4 oz/1,000 ft of row	0.8 cd	
		Agrisure N58S-GT (Conventional)	2.2 a	

[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 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.