

On-Farm Corn and Soybean Management Trials

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Introduction

Farmers are faced with many decisions in managing corn and soybeans as new technologies are introduced, such as drought-tolerant and pest-resistant corn hybrids, new seed treatments, and new methods of pest management. 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. It also is important for farmers to adopt tillage practices that not only maximize profits, but also conserve the soil. Planting soybeans at the optimum time is important to maximize yields. The objective of these trials was to investigate what effect various corn and soybean management practices would have on grain yield.

Materials and Methods

In 2015, nine trials investigating various management practices in corn and soybeans 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.

Trial 1 investigated various methods of managing corn rootworm. Two transgenic hybrids, Duracade[®] and Agrisure[®], were planted with and without an in-furrow

application of Force[®] 3G insecticide on corn ground. These were compared with a conventional hybrid planted with and without Force 3G. Root ratings were made in mid-August using the Iowa State Node Injury scale (0-3). In Trial 2, two drought tolerant corn hybrids were compared with two conventional hybrids.

In Trial 3, the effect of Cobra[®] herbicide on white mold suppression and soybean yield was investigated. In Trial 4, the effect of two tillage systems (no-till vs. one pass with a soil finisher) on soybean yield was investigated. In Trial 5, the effect of three different weed management systems on weed control and soybean yield was investigated. A system using a conventional variety was compared with systems using Liberty-Link[®] and Roundup Ready[®] soybeans.

In Trial 6, soybeans treated with Vault[®] and Warden[™] seed treatment were compared with soybeans planted without the seed treatment. Vault is marketed by Becker Underwood Limited and contains an inoculant and a biological fungicide. Warden is marketed by AgriSolutions and contains two fungicides. In Trial 7, soybeans planted with the seed treatment ILeVO[®] were compared with soybeans planted without a seed treatment. ILeVO is marketed by Bayer Crop Science and is labeled for soybean sudden death syndrome. Trials 8 and 9 investigated the effect of planting date on soybean yield.

Results and Discussion

In Trial 1, there was no yield difference among the four treatments of the two transgenic hybrids with or without the insecticide, showing there was no advantage to using an insecticide in addition to the Bt trait in protecting the corn from corn rootworm (Table 2). The root ratings for the

two transgenic hybrids with or without insecticide all were less than 0.1 compared with a root rating of 1.0 for the conventional hybrid without insecticide, indicating there is no evidence of rootworms resistant to either Bt trait used in this field (Table 3). The conventional hybrid with insecticide yielded significantly greater than the conventional hybrid without insecticide ($P = 0.02$). The root rating for the conventional hybrid with Force insecticide was 0.35, which was not significantly different from the root ratings of any of the transgenic hybrid treatments ($P = 0.05$). The results of this study indicate using a corn hybrid containing a Bt trait or using a conventional hybrid with an in-furrow insecticide at planting are equally effective in managing corn rootworms in this field.

In Trial 2, there was a significant yield advantage to the Wyffels drought tolerant corn hybrid compared with a conventional Wyffels hybrid, even though there were no drought conditions in the field. This suggests the yield potential may be greater for the drought tolerant hybrid, at least under the conditions in this field in 2015. There was no difference in yield between the Pioneer drought tolerant hybrid and the conventional Pioneer hybrid.

In Trial 3, there was not a significant yield difference between soybeans sprayed with Cobra and unsprayed soybeans, even though white mold was present in the field and there appeared to be less white mold in the sprayed strips. The field also received an application of Aproach[®] fungicide the day after the Cobra application. Aproach is labeled for white mold control, so this may have reduced the likelihood of seeing a positive yield response from the Cobra application.

In Trial 4, there was no difference in soybean yield between soybeans planted no-till and soybeans planted after one pass with a soil finisher. The soybeans were treated with

Acceleron seed treatment in this plot. Most past research has shown no yield advantage to soybeans planted on tilled fields vs. soybeans planted no-till. In Trial 5, there was a significant soybean yield advantage with the Roundup Ready system compared with either the Liberty-Link system or conventional system ($P = 0.09$). There was near complete control of all weeds in all systems, so the yield difference was likely due to a difference in genetics rather than differences in weed control.

In Trial 6, there was no difference in yield between the soybeans planted with the Warden and Vault seed treatment and soybeans planted without the seed treatment. The field had been in a corn-soybean rotation for many years, reducing the chances of there being a need for the inoculant. It is likely there was not much seedling disease present, reducing the chances of a yield response to the fungicides. In Trial 7, there was no difference in yield between the soybeans planted with ILeVO seed treatment and those planted without the seed treatment. There was no sudden death syndrome present in the field, which would have reduced the chance of a yield response.

In Trial 8, there was a significant yield increase of 5 bushels/acre ($P = 0.01$) with the soybeans planted in mid-May compared with the soybeans planted in late April. Most research has shown a yield advantage to early planting. A full-season soybean variety (2.8 maturity) was used in this study. There was a later than normal frost in the fall, which would have allowed the soybeans to mature with the late planting. In Trial 9, there was a significant soybean yield increase of 5 bushels/acre to planting in late April versus mid-May ($P = 0.02$). An early-season soybean variety (2.0 maturity) was used in this study.

Table 1. Variety, planting date, planting population, previous crop, and tillage practices in on-farm trials investigating various management practices in corn and soybean in 2015.

Exp. no.	Trial	Management practice	County	Variety	Row spacing	Planting date	Planting population (seeds/A)	Previous crop	Tillage
150116	1	Corn rootworm management	Sioux	NK N585-522, 53W3122, and 53W3	30	5/4/15	34,000	Corn	Conventional
150301	2	Drought tolerant corn	Monona	Wyffels W7476RIB & W7506DRIB, Pioneer P1023AM & P1151AM	38 twin row	5/5/15	33,000	Soybean	No-till
150142	3	White mold suppression in soybean	Sioux	Hefty 28H4	15	4/30/15	144,000	Corn	Conventional
150150	4	Tillage practices in soybean	Lyon	Asgrow 1935	22	5/13/15	135,000	Corn	No-till vs. soil finisher
150147	5	Weed management in soybean	Sioux	Croplan R2T2501, Pioneer P92M72, Croplan LC2384	30	5/2/15	140,000	Oats	Conventional
150130	6	Seed treatment in soybean	Lyon	Croplan RC2020	15	5/13/15	128,000	Corn	No-till
150702	7	Seed treatment in soybean	Louisa	Asgrow 3432	30	4/30/15	150,000	Corn	Fall & spring vertical till
150122	8	Planting date in soybean	Sioux	Pioneer 28T33R	30	4/28/15 & 5/13/15	140,000	Corn	No-till
150155	9	Planting date in soybean	Sioux	Pioneer 20T79R	30	4/28/15 & 5/13/15	140,000	Corn	No-till

Table 2. Yields for on-farm corn and soybean in trials investigating various management practices in 2015.

Exp. no.	Trial	Treatment	Yield (bu/A) ^a	P-value ^b
150116	1	Duracade (NK N585–5222) with Force 3G in-furrow at 5.5 lb/ac	189 ab	0.02
		Duracade (NK N585–5222) without insecticide	180 ab	
		Agrisure (NK 53W3122) with Force 3G in-furrow at 5.5 lb/ac	190 ab	
		Agrisure (NK 53W3122) without insecticide	184 ab	
		Conventional (NK 53W3) hybrid with Force 3G in-furrow at 5.5 lb/ac	194 a	
		Conventional (NK 53W3) without insecticide	178 b	
150301	2a	Wyffels W7476RIB (non drought tolerant)	209 a	0.04
		Wyffels W7506DGRIB (drought gard)	218 b	
	2b	Pioneer P1023AM (non drought tolerant)	219 a	
		Pioneer P1151AM Aquamax (drought tolerant)	213 a	
150142	3	Cobra Applied at 4.3 oz/ac at R2	72 a	0.17
		Control	69 a	
150150	4	One pass with a soil finisher	77 a	0.67
		No-Till	76 a	
150147	5	Weed management with conventional soybeans	71 a	0.09
		Weed management with Roundup Ready soybeans	76 a	
		Weed management with Liberty Link soybeans	71 a	
150130	6	Warden and Vault seed treatment	73 a	0.51
		Control	73 a	
150702	7	ILeVO seed treatment	75 a	0.98
		Control (Acceleron + Poncho/Votivo)	75 a	
150122	8	Planted 4/28/15	72 a	0.01
		Planted 5/13/15	77 b	
150155	9	Planted 4/28/15	74 a	0.02
		Planted 5/13/15	69 b	

^aValues denoted with the same letter within a trial are not statistically different at the significance level of 0.05.

^bP-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 1.

Exp. no.	Trial	Treatment	Root rating ^{ab}	P-value ^c
150116	1	Duracade (NK N585–5222) with Force 3G in-furrow at 5.5 lb/ac	0.01 a	<0.01
		Duracade (NK N585–5222) without insecticide	0.09 a	
		Agrisure (NK 53W3122) with Force 3G in-furrow at 5.5 lb/ac	0.01 a	
		Agrisure (NK 53W3122) without insecticide	0.02 a	
		Conventional (NK 53W3) hybrid with Force 3G in-furrow at 5.5 lb/ac	0.35 a	
		Conventional (NK 53W3) without insecticide	1.01 b	

^aIowa State Node-Injury scale (0–3). Number of full or partial nodes completely eaten.

^bValues denoted with the same letter within a trial are not statistically different at the significance level of 0.05.

^cP-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.