ISU On-Farm Cooperator Trials: Relationships and Partnerships–2016

RFR-A1656

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Iowa State University (ISU) has a long-standing relationship with Iowa corn and soybean farmers. As a part of this relationship, ISU works to provide quality, unbiased information to assist the decision-making process on farm operations. In 2006, ISU began to expand this commitment with the assistance of northwest Iowa farmers by conducting more trials in their fields. The ISU on-farm cooperator trial program has grown to cover other areas across Iowa. The program links the resources of the ISU research farms, the technical expertise of the ISU field agronomists, the support of the local research farm associations, and volunteer farmer-cooperators to create a system of on-farm trials for Iowa.

In 2016, 62 farmer-cooperators in 24 counties assisted in conducting 120 on-farm trials. In addition, ISU has long-term partnerships that support agricultural research locations (research farms) across Iowa. The following groups have endorsed and supported the ISU on-farm trial program.

Committee for Agricultural Development, Ames, IA
North Central Iowa Research Association, Kanawha, IA
Northeast Iowa Agricultural Experimental Association, Nashua, IA
Northwest Iowa Experimental Association, Sutherland, IA
Southeast Iowa Agricultural Research Association, Crawfordsville, IA
Wallace Foundation for Rural Research and Development, Lewis, IA
Western Iowa Experimental Farm Association, Castana, IA

Sponsors for 2016 On-Farm Cooperator Trials

The ISU On-Farm Cooperator Trials program was made possible in part by support and donations of products or funding from these sponsors/donors. We recognize the following entities for their support of the ISU On-Farm Cooperator Trials program.

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Witthoft Farm Supply	Ainsworth, IA
Wyffels Hybrids (Mike Lage)	Blencoe, IA
Wyffels Hybrids (Bill Backhaus)	Griswold, IA

2016 On-Farm Trial Cooperators

The following farmer cooperators conducted on-farm trials in their fields during 2016.

Steve Abma	Rock Valley, IA	Dan Miller	Anita, IA
Wade Amos	Griswold, IA	Tom Miller	Mt. Pleasant, IA
Cliff Aupperle	Wiota, IA	Jerry Mitchell	Charles City, IA
Don Bahe	Stanley, IA	Rodney Mogler	Alvord, IA
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Joel Bubke	Ute, IA	Mike Noll	Griswold, IA
Dan Caffrey	Cresco, IA	Bruce Potter	Griswold, IA
Mike Casey	Griswold, IA	Max Potter	Greenfield, IA
Kenny Cousins	Greenfield, IA	Ben Reinig	Portsmouth, IA
Wes DeGroot	Doon, IA	Tom Reinig	Portsmouth, IA
Tim Denney	Atlantic, IA	Brad Ritter	Charles City, IA
Dordt College	Sioux Center, IA	Rich Rosener	Vail, IA
Scott Drake	Lewis, IA	Dave Rossman	Hartley, IA
Craig Elliott	Bedford, IA	Jeff Schaben	Earling, IA
David Erwin	Crawfordsville, IA	Jerry Schaben	Defiance, IA
Randy Euken	Lewis, IA	Lester Schnabel	Sheffield, IA
FSC	Oakland, IA	Beth Severson	Clarion, IA
Joel Greene	Crawfordsville, IA	Brian Sievers	Newell, IA
Jerry Hammen	Fonda, IA	Layne Twinam	Crawfordsville, IA
Katie Holmes	Clarion, IA	Wally Unkrich	Winfield, IA
Luke Homan	Remsen, IA	Chad Van Regenmorter	Inwood, IA
J & P Farms	Griswold, IA	Pete Van Regenmorter	Inwood, IA
Dennis Jipsen	Lewis, IA	Larry Warner	Larchwood, IA
Edwin Johnson	Clarion, IA	Mark Warner	Larchwood, IA
Marty Knobloch	Larchwood, IA	Westwood FFA	Mapleton, IA
Susan Massman	Elgin, IA	Duane Winston	Atlantic, IA
Morris Metzger	Larchwood, IA	Ron Zelle	Waverly, IA
Dean Meyer	Rock Rapids, IA	Bruce Zomermaand	Sioux Center, IA

On-Farm Corn Hybrid Trials

RFR-A1661

Jim Fawcett, extension field agronomist (retired)
Josh Sievers, Northwest Farm, former superintendent
Joel DeJong, extension field specialist
Karl Nicolaus, Northern Farm, ag specialist
Zack Koopman, AEA Farm, ag specialist
Lyle Rossiter, Allee Farm, superintendent
Tyler Mitchell, Northeast Farm, ag specialist

Introduction

Farmers are faced with hybrid selection decisions each year as new hybrids are introduced, including transgenic hybrids with several traits for insect and herbicide resistance. 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 hybrids on corn yield and/or resistance to corn rootworms.

Materials and Methods

In 2016, five trials comparing two or more corn hybrids 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, five hybrids (two Pioneer, two Golden Harvest, and one Dekalb) were compared on soybean ground (Table 2). The Pioneer hybrids and Golden Harvest GO2W74-3000 were conventional hybrids and the Dekalb and Golden Harvest GO7F23-3111 were transgenic hybrids containing Bt for rootworm. In Trial 2, three Agrisure® hybrids were compared on corn ground with and without Force insecticide at 3.5 lb/acre. One was a conventional hybrid, one was Smartstax®, and one a VT3 hybrid. Root ratings were made in Trial 2 in late August using the Iowa State Node Injury (0-3) scale (Table 3). In Trial 3, two Smartstax® hybrids were compared with and without Aztec insecticide at 7.3 lb/acre on soybean ground. In Trial 4, four Agrigold hybrids were compared on soybean ground. One was a conventional hybrid, one a Roundup Ready, one a VT2, and one a SmartStax® hybrid. In Trial 5, two Pioneer hybrids were compared on soybean following a rye cover crop. One hybrid had corn borer and rootworm transgenic traits and the other did not.

Results and Discussion

In Trial 1, there were significant yield differences among the five hybrids, with Pioneer PO589R having the highest yield and Pioneer PO157R having the lowest yield ($P < 0.01$). Because one of the conventional Pioneer hybrids had the highest yield, it is likely the yield difference among hybrids was mainly due to differences in genetics and not to rootworm injury. In Trial 2, the conventional hybrid yielded less than either the SmartStax® or VT2 hybrid. The Force insecticide increased the yield of the conventional hybrid by 37 bushels/acre. The insecticide did not increase the yield of either of the transgenic hybrids. The conventional hybrid without insecticide had considerably more root feeding than the other hybrids, with more than an entire node of roots missing (Table 3). The insecticide treatment reduced the root feeding on the conventional hybrid. Very little root feeding was present on the transgenic hybrids, with or without the insecticide.

In Trials 3 and 4, there was no difference in yield among the various hybrids and hybrid/insecticide combinations, indicating corn rootworms were likely not a problem on the soybean ground in these two fields. In Trial 5, the hybrid with the Bt for rootworm trait (Pioneer PO157AM) yielded 20 bushels/acre more than the conventional hybrid ($P < 0.01$), indicating this field likely has a problem with rotation resistant corn rootworms. These results show the importance of using numerous strategies in controlling corn rootworms.

Table 1. Variety, planting date, planting population, previous crop, and tillage practices in on-farm corn and soybean variety trials in 2016.

Exp. no.	Trial	County	Variety	Row spacing	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160826	1	Floyd	Pioneer PO157R, Golden Harvest GO2W74-3000, Pioneer PO589R, Dekalb DKC53-56RIB, & Golden Harvest GO7F23-3111	30	4/24/16	32,000	Soybean	No-till
160104	2	Sioux	Syngenta 58F-5222, N53W-3122, & N53W3	30	5/17/16	34,000	Corn	Conventional
160407	3	Kossuth	LG499 & LG499 Smart Stax	30	4/16/16	32,000	Soybean	Conventional
160502	4	Story	Agrigold 6416VT2, A6416, A6416RR, & A6416SS	30	4/26/16	34,000	Soybean	Spring field cultivate
160201	5	Buena Vista	Pioneer PO157 (PPST 250 Raxil, AQUAmax) & Pioneer PO157AM Blend (Roundup Ready 2, Liberty Link, Herculex 1, Yield guard corn borer, PPST 250 Raxil, AcreMax, AQUAmax)	36	5/20/16	34,7000	Soybean (followed by rye cover crop)	Spring field cultivate

Table 2. Yields for on-farm hybrid trials in corn in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160826	1	Pioneer PO157R (Conventional)	197 d	<0.01
		Golden Harvest GO2W74-3000 (Conventional)	203 c	
		Pioneer PO589R (Conventional)	213 a	
		Dekalb DKC53-56RIB (SmartStax)	210 b	
		Golden Harvest GO7F23-3111 (Duracade)	205 c	
160104	2	Agrisure N58F-5222 (SmartStax) with Force at planting at 3.5 lb/ac	211 a	<0.01
		Agrisure N53W-3122 (VT3) with Force at planting at 3.5 lb/ac	193 b	
		Agrisure N53W3 (Conventional) with Force at planting at 3.5 lb/ac	194 b	
		Agrisure N58F-522 (SmartStax)	209 a	
		Agrisure N53W-3122 (VT3)	187 b	
		Agrisure N53W3 (Conventional)	157 c	
160407	3	LG5499 (Conventional)	231 a	P = 0.72
		LG5499 (Conventional) with Aztec at 7.3 lb/ac at planting	233 a	
		LG5499 (SmartStax)	227 a	
		LG5499 (SmartStax) with Aztec at 7.3 lb/ac at planting	229 a	
160502	4	Agrigold A6416VT2 (VT2)	232 a	P = 0.52
		Agrigold A6416 (Conventional)	228 a	
		Agrigold A6416rr (Roundup Ready)	229 a	
		Agrigold A6416ss (SmartStax)	220 a	
160201	5	Pioneer PO157 (Conventional)	214 a	P < 0.01
		Pioneer PO157AM (Herculex)	234 b	

[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]
160104	2	Agrisure N58F-5222 (SmartStax) with Force at planting at 3.5 lb/ac	0.01 a	<0.01
		Agrisure N53W-3122 (VT3) with Force at planting at 3.5 lb/ac	0.01 a	
		Agrisure N53W3 (Conventional) with Force at planting at 3.5 lb/ac	0.35 b	
		Agrisure N58F-522 (SmartStax)	0.09 ab	
		Agrisure N53W-3122 (VT3)	0.02 a	
		Agrisure N53W3 (Conventional)	1.08 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 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.

On-Farm Corn and Soybean Fertilizer Trials

RFR-A1657

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Jim Rogers, Armstrong Farm, ag specialist
Lance Miller, Southeast Farm, former ag specialist
Cody Schneider, Southeast Farm, ag specialist
Tyler Mitchell, Northeast Farm, ag specialist
Chris Beedle, Western Farm, superintendent
Lyle Rossiter, Allee Farm, superintendent

Introduction

All cropping systems require fertilizer inputs to maintain crop yields. However, excess fertilizer, especially nitrogen (N) and phosphorus, can increase problems with water quality. It is important for farmers to use the appropriate rates and methods of fertilizer application to optimize yields and minimize the impact on the environment. The purpose of these trials was to investigate the effect of various fertilizer practices on crop yield.

Materials and Methods

In 2016, 18 trials utilizing various methods of fertilizing corn were conducted (Table 1) and six trials investigated the effect of a foliar fertilizer product on soybean (Table 2). All trials were conducted on-farm by farmer cooperators. 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.

Many of the corn trials investigated applying a base rate of N or manure in the fall or spring with or without an additional application of N at planting or side-dressed. In Trials 1, 6, 7, 10, and 18, a fall application of manure or N with or without additional N at planting or side-dressed was investigated. In Trials 3, 4, 5, 9, 11, and 14, a preplant application of N was applied with or without additional N after planting or side-dressed. In Trial 2, four rates of N (0, 50, 100, and 150 lb/acre) were applied preplant. In Trial 8, two rates of N (0 and 90 lb/acre) were applied side-dressed. Five trials (12, 13, 15, 16, and 17) investigated the effect of starter fertilizer on corn yield.

In all of the soybean fertilizer trials, Fast2Grow® was foliar-applied to soybean at V2 to V5 and compared with soybean that did not receive the application. Fast2Grow® is marketed as a poultry manure derived bio-stimulant.

Results and Discussion

Most of the corn trials investigating the application of additional N following a base rate of N or manure did not show an economical response to the additional N. In Trial 1, the side-dress application of a variable rate of 35 to 70 lb/acre N to corn at the V18 crop growth stage after the fall application of 3,500 gal/acre of liquid swine manure increased the corn yield by four bushels/acre, but this would not likely have paid for the additional N (Table 3). There also was a yield response to the additional N applied after the fall application of cattle manure in Trial 7, but the response was not likely sufficient to pay for the N. In Trials 3, 4, 5, 10, 11, and 14 there was no yield response to the additional N applied. In Trial 9, the additional 30 lb/acre N applied side-dress following the 180 lb/acre N preplant resulted in a seven bushels/acre yield increase, which was likely enough to pay for the extra N application. In Trial 18, the additional 40 lb/acre N applied at planting following the fall application of 160 lb/acre N in 4,000 gal/acre of liquid swine manure resulted in a significant yield increase of 13 bushels/acre (P < 0.01). This may have been due to the very wet and warm December causing some N losses from the fall application.

There was a significant yield response to the N application in Trial 2 of up to 100 lb/acre. In Trial 6, the side-dress application of 200 lb/acre at crop growth stage V3 following the preplant application of 60 lb/acre yielded four bushels/acre more than the side-dress of 160 lb/acre, but the extra 40 lb/acre would not likely have been economical. In Trial 8, there was no significant yield increase with the side-dress application of 90 lb/acre compared with no N application. The yields were very low in this trial, perhaps because of the late planting and poor soil, and the late side-dress application (R1) would have reduced the likelihood of response to the N. In most trials, N rates of about 100 to 150 lb/acre were sufficient to get optimum corn yields on soybean ground. At current corn and N prices, the recommended rate of N would be approximately 125 lb/acre on soybean ground. This is the Maximum Return to Nitrogen rate calculated using the corn nitrogen rate calculator at http://extension.agron.iastate.edu/soilfertility/nrate.aspx. Weather conditions are important in determining how corn responds to N rates and application timings, so different results might be seen in other years.

In Trials 12, 13, and 15, there was no significant yield increase from the in-furrow starter fertilizer application (P = 0.05), but there was a significant yield increase of five bushels/acre in Trial 16 (P < 0.01) and Trial 17 (P = 0.06). The soil test levels of P and K were optimum or higher in all of the trials, which would have reduced the likelihood of a yield response.

In the soybean trials, the Fast2Grow® foliar application did not result in a yield increase in any of the trials and resulted in a significant yield decrease of three bushels/acre (P = 0.09) in Trial 6 (Table 4).

Table 1. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 fertilizer trials on corn.

Exp. no.	Trial	County	Hybrid	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160138	1	Lyon	Dekalb DKC58-06	30	5/5/16	34,000	Soybean	No-till
160811	2	Fayette	Dekalb DK5806	20	5/25/16	36,000	Oats	No-till
160709	3	Henry	Dekalb DK61R79	30	4/15/16	34,800	Soybean	No-till
160102	4	Sioux	Pioneer PO589AM	30	5/16/16	34,000	Soybean	Conventional
160710	5	Henry	Pioneer P1197AM	30	4/16/16	34,800	Soybean	No-till
160702	6	Washington	Dekalb DK61-54	30	4/15/16	34,000	Corn	Fall chisel, Spring field cultivate
160213	7	Buena Vista	Golden Harvest GO14R38	30	5/18/16	35,000	Soybean	Disc, field cultivate
160654	8	Cass	Epley E2105GT	30	5/24/16	34,500	Soybean	Disked
160655	9	Cass	Epley E2105GT	30	5/21/16	34,500	Soybean	No-till
160657	10	Pottawattamie	Wyffles 4796	30	4/11/16	35,000	Soybean	No-till
160658	11	Pottawattamie	Dekalb DK4812	30	4/20/16	32,000	Soybean	No-till
160112	12	Lyon	Dekalb DK53-56	30	5/16/16	35,000	Soybean	Conventional
160122	13	Osceola	Dekalb DK53-56	30	4/16/16	37,500	Corn	Conventional
160215	14	Crawford	Golden Harvest GO14R38	30	5/6/16	32,000	Corn	Fall disked, Spring field cultivate & harrow
160144	15	Osceola	Channel 196-77	30	5/16/16	31,400	Soybean	Conventional
160145	16	Dickinson	Pioneer P0453	30	5/8/16	34,100	Soybean	Conventional
160640	17	Pottawattamie	Dekalb DK62-98	30	4/25/16	33,000	Soybean	No-till
160701	18	Washington	RobSeCo 6401	30	4/17/16	36,000	Soybean	Conventional

Table 2. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 fertilizer trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160643	1	Cass	4-star 2y262	30	7/1/16	160,000	Corn	No-till
160602	2	Cass	Epley ESB254NRR	30	5/30/16	128,000	Corn	No-till
160603	3	Cass	Epley ESB282	30	5/22/16	145,000	Corn	Disked
160606	4	Cass	Pioneer PI34T7	30	5/19/16	155,000	Corn	No-till
160647	5	Cass	Nutech 7307	30	5/10/16	160,000	Corn	No-till
160661	6	Adair	Pioneer P30t211	30	5/28/16	165,000	Corn	No-till

Table 3. Yield from on-farm corn fertilizer trials in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160138	1	3,500 gal/ac liquid swine manure in the fall	259 a	0.01
		3,500 gal/ac liquid swine manure in the fall plus Encirca N Y-drop variable rate of 35 to 70 lb N/ac as 32% UAN at V18	263 b	
160811	2	No N fertilizer	117 a	<0.01
		50 lb/ac N as anhydrous ammonia preplant	151 b	
		100 lb/ac N as anhydrous ammonia preplant	201 c	
		150 lb/ac N as anhydrous ammonia preplant	222 c	
160709	3	150 lb/ac N as NH3 preplant	248 a	0.57
		150 lb/ac N as NH3 preplant + 25 lb/ac N as UAN pre-emergence	249 a	
160102	4	50 lb/ac N as urea preplant plus 100 lb/ac N as 28% UAN at V12	240 a	0.82
		150 lb/ac N as urea preplant	241 a	
		100 lb/ac N as urea preplant plus 50 lb/ac N as 28% UAN at V12	237 a	
		150 lb/ac N as 28% UAN at V12	241 a	
160710	5	150 lb/ac N as NH3 preplant	261 a	0.29
		150 lb/ac N as NH3 preplant + 25 lb/ac N as UAN pre-emergence	266 a	
160702	6	60 lb/ac N as NH3 in the fall plus 160 lb/ac N as NH3 side-dressed at V3	232 a	0.02
		60 lb/ac N as NH3 in the fall plus 200 lb/ac N as NH3 side-dressed at V3	236 b	
160213	7	2.5 T/ac cattle manure in fall and winter plus 50 lb/ac N as 32% UAN side-dress at V3	230 a	<0.01
		2.5 T/ac cattle manure in fall and winter plus 100 lb/ac N as 32% UAN side-dress at V3	236 b	
		2.5 T/ac cattle manure in fall and winter plus 150lb/ac N as 32% UAN side-dress at V3	240 c	
160654	8	90 lb/ac N as 28% UAN side-dressed at R1	108 a	0.30
		No N fertilizer	97 a	

Table 3. Yield from on-farm corn fertilizer trials in 2016 (cont.).

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160655	9	180 lb/ac N as NH3 preplant plus 30 lb/ac N as 28% at R1	162 a	0.05
		180 lb/ac N as NH3 preplant	155 b	
		170 lb/ac N as NH3 in the fall plus 100 lb/ac N as urea at V5	236 a	0.30
160657	10	170 lb/ac N as NH3 in the fall	234 a	
		160 lb/ac N as NH3 preplant plus 100 lb/ac N as urea at V5	219 a	0.56
160658	11	160 lb/ac N as NH3 preplant	215 a	
160112	12	2.75 gal/ac 10-34-0 plus 1 qt/ac zinc (8% chelated) starter fertilizer	207 a	0.19
		No starter fertilizer	202 a	
		4 gal/ac 6-24-6 starter fertilizer in-furrow	259 a	0.79
160122	13	No starter fertilizer	258 a	
160215	14	130 lb/ac N preplant as 32% UAN plus 5 lb/ac N starter as 9-18-9 plus 30 lb/ac N side-dressed at V5 as 32% UAN	254 a	0.16
		130 lb/ac N preplant as 32% UAN plus 5 lb/ac N starter as 9-18-9 plus 60 lb/ac N side-dressed at V5 as 32% UAN	256 a	
		130 lb/ac N preplant as 32% UAN plus 5 lb/ac N starter as 9-18-9 plus 90 lb/ac N side-dressed at V5 as 32% UAN	256 a	
160144	15	4 gal/ac 6-24-6 starter fertilizer in-furrow	208 a	0.09
		No starter fertilizer	210 a	
160145	16	4 gal/ac 6-24-6 starter fertilizer in-furrow	244 a	<0.01
		No starter fertilizer	239 b	
160640	17	5 gal/ac of 9-18-9 starter fertilizer in-furrow	211 a	0.06
		No starter fertilizer	206 a	
160701	18	160 lb/ac N in fall in 4,000 gal/ac of liquid swine manure	223 a	<0.01
		160 lb/ac N in fall in 4,000 gal/ac of liquid swine manure + 40 lb/ac N as UAN at planting	236 b	

[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 4. Yield from on-farm soybean fertilizer trials in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160643	1	Fast2Grow at 32 oz/ac at V2	46 a	0.48
		Control	48 a	
160602	2	Fast2Grow at 32 oz/ac at V2	56 a	0.73
		Control	56 a	
160603	3	Fast2Grow at 32 oz/ac at V4 and 32 oz/ac at V5	56 a	0.75
		Control	57 a	
160606	4	Fast2Grow at 32 oz/ac at V5	70 a	0.40
		Control	69 a	
160647	5	Fast2Grow at 32 oz/ac at V5	55 a	0.11
		Control	56 a	
160661	6	Fast2Grow at 32 oz/ac at V5	59 a	0.09
		Control	62 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.

On-Farm Corn and Soybean Fungicide Trials

RFR-A1658

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Karl Nicolaus, Northern Farm, ag specialist
Chris Beedle, Western Farm, superintendent

Introduction

An application of foliar fungicide to corn and soybean has become a common input for many farmers in Iowa. The effect of fungicide on corn and soybean yield, however, can vary from year to year. Environmental conditions, such as rainfall and temperature, influence disease development, which will determine whether a fungicide affects yield. Because environmental conditions vary from one year to the next, it is difficult to predict how and when to use a fungicide. The objective of these trials was to evaluate whether the application of a foliar fungicide would result in a yield increase in corn and soybean.

Materials and Methods

In 2016, there were eight on-farm trials in Iowa that evaluated the effect of fungicide on corn yield (Table 1), and three trials investigated the effect of fungicide on soybean yield (Table 2). All trials were conducted on cooperators' farms. Fungicide treatments were applied by ground equipment and were arranged in a randomized complete block design with at least three replications per treatment. Plot size varied from field-to-field depending on the field equipment. All plots were machine harvested for grain yield.

In four trials (1, 6, 7, 8), Aproach® at 6 oz/acre or Headline AMP® at 10 oz/acre were applied to corn at R1-R2. In Trial 2, Trivapro® at 14.6 oz/acre was applied to corn at V6, R1, and V6 and R1. In Trial 3, Preemptor SC® was applied to corn at V5 at 2 oz/acre and 4 oz/acre. In two trials (4 and 5), Headline® was applied in-furrow at 6 oz/acre. In soybean Trial 1, Cobra® was applied for white mold control at 2 oz/acre to soybeans at R1. In Trial 2, an application of Quilt Excel® at 10.5 oz/acre to soybeans at R5 was compared with an application of Trivapro® at 10.5 oz/acre. In Trial 3, Trivapro® at 14.6 oz/acre was applied to soybeans at R3. In all trials, the corn and soybean strips treated with a fungicide application were compared with untreated strips.

Results and Discussion

Aproach® at 6 oz/acre applied to corn at R1 had no effect on the yield in corn Trial 1 and in Trial 2, Trivapro® at 10 oz/acre applied to corn at R1 and applied twice to corn at V6 and R1 also had no effect on corn yield (Table 3). There was no significant yield increase with the fungicide application in Trials 2 and 3 with the applications made to corn at V5-V6, or in Trials 4 and 5 with the fungicide applied in-furrow. There was a significant yield increase of 7 to 8 bushels/acre with the applications to corn at R1 of Headline AMP® at 10 oz/acre in Trials 7 and 8 ($P < 0.01$), but no effect on yield in Trial 6.

The Cobra® application in soybean Trial 1 did not affect soybean yield (Table 4). Low levels of white mold were present in the field. Quilt Excel® applied at 10.5 oz/acre to R5 soybeans had no effect on soybean yield in Trial 2. Trivapro® at 10.5 to 14.6 oz/acre applied to soybeans at R3 to R5 had no effect on soybean yield in Trial 3, but increased yield by seven bushels/acre in Trial 2. The Trivapro®

application in soybean Trial 2 was the only fungicide application in corn or soybean that was likely profitable with current corn and soybean prices.

Although plant disease evaluations were not made in most of the trials, it is likely there was not much disease present in the corn and soybean trials where there was not an economic response to the fungicide. This indicates the importance of evaluating plant disease incidence and the likelihood of disease problems with current weather conditions and varieties selected in making decisions on the use of foliar fungicides in protecting corn and soybean yield.

Table 1. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 fungicide trials on corn.

Exp. no.	Trial	County	Hybrid	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160101	1	Plymouth	Pioneer P0937AM	30	5/6/16	35,000	Corn	Conservation
160136	2	Sioux	Pioneer PO589AM	30	5/4/16	34,000	Soybean	Conventional
160712	3	Washington	Agri Gold 65-38vt2rib	30	4/23/16	34,000	Soybean	No-till
160121	4	Osceola	Pioneer PO216	30	4/17/16	33,100	Corn	Fall manure injection, spring field cultivate
160139	5	Osceola	Pioneer PO157	30	4/17/16	35,700	Corn	Fall manure injection, spring field cultivate
160402	6	Wright	Croplan 4199SSrib	30	4/16/16	35,000	Corn	Conventional
160414	7	Wright	Pioneer 9929AMX	30	4/16/16	35,000	Corn	Conventional
160415	8	Wright	Dekalb 5440rib	30	4/15/16	35,000	Corn	Conventional

Table 2. Variety, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 fungicide trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160120	1	Sioux	Kruger 2301	15	5/20/16	144,000	Corn	Conventional
160304	2	Monona	Stine 26RD02	Twin row 38	5/13/16	165,000	Corn	No-till
160136	3	Sioux	Pioneer P22T73R	30	5/20/16	140,000	Corn	No-till

Table 3. Yields for on-farm fungicide trials in corn in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160101	1	Aproach at 6 oz/ac at R2	229 a	0.38
		Control	233 a	
160136	2	Control	248 a	0.49
		Trivapro at 14.6 oz/ac at V6	246 a	
		Trivapro at 14.6 oz at R1	252 a	
		Trivapro at 14.6 oz/ac at V6 and R1	249 a	
160712	3	Preemptor SC at 2 oz/ac at V5	243 a	0.53
		Preemptor SC at 4 oz/ac at V5	241 a	
		Control	242 a	
160121	4	Headline at 6 oz/ac in-furrow	241 a	0.94
		Control	241 a	
160139	5	Headline at 6 oz/ac in-furrow	238 a	0.91
		Control	239 a	
160402	6	Control	210 a	0.18
		Headline AMP at 10 oz/ac at R1	213 a	
160414	7	Control	218 a	<0.01
		Headline AMP at 10 oz/ac at R1	226 b	
160415	8	Control	224 a	<0.01
		Headline AMP at 10 oz/ac at R1	231 b	

[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 4. Yields for on-farm fungicide trials in soybean in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160120	1	Cobra at 2 oz/ac at R1	72 a	0.19
		Control	71 a	
160304	2	Trivapro at 10.5 oz/ac at R5	71 a	<0.01
		Quilt Excel at 10.5 oz/ac at R5	68 ab	
		Control	64 b	
160137	3	Control	82 a	0.60
		Trivapro at 14.6 oz/ac at R3	83 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.

On-Farm Corn and Soybean Management Trials

RFR-A1659

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Joel DeJong, extension field specialist
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Tyler Mitchell, Northeast Farm, ag specialist

Introduction

Farmers are faced with many decisions in managing corn and soybeans as new technologies are introduced, such as Bt corn hybrids, new pesticides, and land rolling equipment. Land rolling is the practice of pulling a large, heavy roller across soybean fields to push down rocks, smooth the surface of the field, and help break up residue. The purpose is to protect harvest equipment that could be vulnerable to rocks and corn roots. Yields are expected to improve by creating a more uniform harvest. 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. The objective of these trials was to investigate what affect various corn and soybean management practices would have on grain yield.

Materials and Methods

In 2016, 11 trials on various management practices in corn and soybean were conducted (Table 1). All trials were conducted on-farm by farmer cooperators. 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.

Trials 1, 2, and 3 investigated planting a transgenic corn hybrid with insect control traits with and without a rootworm insecticide. In Trial 1, Pioneer P0193AMX was planted with and without Aztec insecticide. In Trials 2 and 3, Dekalb DK53-56STX was planted with and without Aztec insecticide. Trial 1 was planted on soybean ground and Trials 2 and 3 were planted on corn ground.

In Trials 4, 5, and 6, a weed management system using Roundup® (glyphosate) was compared with a weed management system using Impact® (topramezone).

In Trials 7 and 8, soybean yields from strips land-rolled two to three days after planting were compared with soybean yields from strips not land-rolled. In Trials 9, 10, and 11, soybean planted no-till was compared with soybean planted with spring tillage. In Trial 9, mulch tillage was compared with no-till; in Trial 10, strip tillage was compared with no-till; and in Trial 11, a spring disking and field cultivation was compared with no-till.

Results and Discussion

In Trials 1, 2, and 3, there was no yield difference between the corn planted with an insecticide and corn planted without an insecticide (Table 2). This indicates the transgenic traits in the corn hybrids were providing sufficient control of any corn rootworms and other soilborne insects. In Trials 4 and 6, there was no difference in corn yield between the corn with a weed management system utilizing the Roundup® and the system utilizing Impact®. However, in Trial 5, the corn planted with the Impact® system yielded significantly more than the Roundup® system at $P = 0.10$. There was no difference in weed control between the two systems, so the reason for the yield difference is unknown.

In Trial 7, the land-rolled soybean yielded two bushels/acre more than the soybean not land-rolled. But in Trial 8, the land-rolled soybean yielded five bushels/acre less than the soybean not land-rolled. This would indicate positive yield responses to land rolling will likely be inconsistent.

In Trials 9, 10, and 11, no difference in soybean yield was seen between the no-till soybean and soybean where spring tillage was used. This agrees with most research that has shown no yield advantage to doing any tillage prior to soybean planting.

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 2016.

Exp. no.	Trial	Management practice	County	Variety	Row spacing	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160111	1	Rootworm insecticide	Sioux	Pioneer P0193AMX	30	5/6/16	34,000	Soybean	Conventional
160115	2	Rootworm insecticide	Lyon	DeKalb DK53-56 STX	22	5/5/16	VR 36,000	Corn	Conventional
160140	3	Rootworm insecticide	Lyon	DeKalb DK53-56 STX	22	5/5/16	VR 36,000	Corn	Conventional
160141	4	Roundup vs. Impact	Lyon	Dekalb DK53-56 STX	30	5/5/16	VR 36,000	Corn	Conventional
160142	5	Roundup vs. Impact	Lyon	Dekalb DK53-56 STX	30	5/5/16	VR 36,000	Corn	Conventional
160143	6	Roundup vs. Impact	Lyon	Pioneer P9929	30	5/5/16	VR 36,000	Corn	Conventional
160814	7	Rolling beans	Howard	NK19-BZ	30	4/24/16	160,000	Corn	No-till
160815	8	Rolling beans	Floyd	Pioneer P22T73R	30	5/5/16	160,000	Corn	Chisel plow
160107	9	Tillage	Sioux	Pioneer P22T73R	30	5/20/16	140,000	Corn	Mulch finish vs. no-till
160828	10	Tillage	Howard	NK 19-BZ	30	4/24/16	163,000	Corn	Strip till vs. no-till
160412	11	Tillage	Kossuth	LG 2259LL	30	5/22/16	150,000	Corn	Spring disc and field cultivate vs. no-till

Table 2. Yields for on-farm corn and soybean trials investigating various management practices in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160111	1	Pioneer P0636 with Aztec 4.67 at 3.37 lb/ac at planting	106 a	0.53
		Pioneer P0636 without insecticide	107 a	
160115	2	DeKalb 53-56 STX without insecticide	201 a	0.10
		Dekalb 53-56 STX with Aztec 4.67 at 0.6 oz/1,000 ft at planting	197 a	
160140	3	DeKalb 53-56 STX without insecticide	229 a	0.57
		Dekalb 53-56 STX with Aztec 4.67 at 0.6 oz/1,000 ft at planting	228 a	
160141	4	Prequel followed by Realm Q plus Roundup	222 a	0.45
		Prequel followed by Realm Q plus Impact	227 a	
160142	5	Prequel followed by Realm Q plus Roundup	224 a	0.10
		Prequel followed by Realm Q plus Impact	241 a	
160143	6	Prequel followed by Realm Q plus Roundup	217 a	0.26
		Prequel followed by Realm Q plus Impact	221 a	
160814	7	Ground land rolled two days after soybean planting	63 a	0.02
		Ground not land rolled	61 b	
160815	8	Ground land rolled three days after soybean planting	59 a	0.02
		Ground not land rolled	64 b	
160107	9	Spring tilled with JD mulch finisher	80 a	0.11
		No-till	82 a	
160828	10	Strip till	61 a	0.57
		No-till	62 a	
160412	11	No-till	57 a	0.89
		Spring disked and field cultivated	58 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.

On-Farm Corn and Soybean Planter Trials

RFR-A1660

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Chris Beedle, Western Farm, superintendent
Karl Nicolaus, Northern Farm, ag specialist
Zack Koopman, AEA Farm, ag specialist
Lance Miller, Southeast Farm, former ag specialist
Cody Schneider, Southeast Farm, ag specialist
Tyler Mitchell, Northeast Farm, ag specialist

Introduction

Corn and soybean planting is one of the most critical operations of the season. Operating the planter with the proper soil conditions for proper placement of the seed to obtain the correct seed-soil contact is important to optimize yields and reduce problems later in the season with plant and root growth. As corn and soybean seed prices continue to rise, and grain prices fall, it is important for farmers to find a population that maximizes both yield and profit. Planting too high of a corn population can result in increased barrenness and thus lower yields, but too low of a population also can result in lower yields. Past studies have indicated soybean yields are similar across a wide range of populations, but too low of a population can result in reduced yields and too high of a population can reduce profits. The objective of these trials was to investigate the effect of various planter operations on corn and soybean yield.

Materials and Methods

In 2016, nine trials investigated the effects of various aspects of corn planter operations on corn yield (Table 1), and six trials investigated the effects of various planter operations on soybean yield (Table 2). 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 length and width varied from field to field depending on field and equipment size. All plots were machine harvested for grain yield.

In corn Trial 1, each row was harvested separately with a 16-row planter to see if there were any differences in yield (Table 3). In Trials 2 and 3, the effect of planter speed on corn yield was investigated. Trial 4 compared using precision planting E-set plates to John Deere 30 cell plates. Trials 5, 6, 7, and 9 investigated the effect of plant population on corn yield. Trial 8 investigated possible problems from soil compaction caused by the planter by comparing corn yield from rows planted with the center of the planter with rows planted with the planter wings. The planter in this study had a bulk center fill tank for the corn seed, which would have resulted in more weight in the center of the planter and thus more potential for soil compaction.

In soybean Trials 1 and 2, the effect of row width on soybean yield was investigated (Table 4). In Trial 3, three populations were planted on two planting dates with both an early-maturing and a late-maturing variety. Trials 4, 5, and 6 investigated the effect of plant population on soybean yield.

Results and Discussion

In corn Trial 1, one outside row yielded about 15 bushels/acre more than the other 15 rows. It is not known what might have caused this yield difference, although it could be due to a slight difference in how this planter unit was adjusted, such as slightly deeper or more shallow planting depth or more or less down pressure. In Trial 2, corn planted with the faster planting speed of 8 mph yielded six bushels/acre more than corn planted with the 6 mph speed (P = 0.08), but there was no significant difference in corn yield with the three planting speeds in Trial 3. In Trial 4, there was no yield difference between the rows planted using precision planting E-set plates and the rows planted using John Deere 30 cell plates. In Trial 5, the lowest seeding rate of 28,000 seeds/acre yielded less than the higher seeding rates (P = 0.06), but in Trials 7 and 8, corn planted with the 28,000 seeds/acre seeding rate yielded as high as corn planted with the higher seeding rates. In Trial 9, corn planted with seeding rates of 29,000 seed/acre yielded the same as corn planted with higher seeding rates, and there was no difference in yield between the two hybrids in the study. Most past research has shown the optimal planting rate for corn yield falls in a range from about 35,000 to 37,000 seeds/acre. These studies indicate there may be opportunities for farmers to reduce their seeding rates, although results will likely vary from year to year.

In soybean Trial 1, there was no difference in yield between the soybean planted in 15-in. rows and the soybean planted in 30-in. rows, but in Trial 2, the soybean planted in 30-in. rows yielded 3 bushels/acre more than the soybean planted in 15-in. rows (Table 4). Most studies have shown if there is a yield advantage, it is usually soybean planted with the narrow rows that out-yield soybean in wider rows, unless white mold or other disease problems are in the field.

In Trial 3, there were many yield differences among the various variety, population, and planting date combinations. The early maturing variety yielded an average of 81 bushels/acre, which was significantly more than the 75 bushels/acre the late maturing variety yielded, and the soybean planted early yielded an average of 80 bushels/acre, which was significantly more than the 75 bushels/acre the late planted soybean yielded at $P < 0.01$ (data not shown). The soybean planted at 100,000 seeds/acre yielded an average of 76 bushels/acre, which was significantly less than the 79 bushels/acre soybean planted at 150,000 seeds/acre, but not significantly less than the 78 bushels/acre soybean planted at 125,000 seeds/acre yielded at P = 0.01 (data not shown). There were no significant differences in soybean yield with the seeding rates used in Trials 4, 5, and 6, with seeding rates as low as 100,000 seeds/acre yielding the same as higher seeding rates. It is usually recommended to seed about 140,000 seeds/acre in order to have a final plant stand of 100,000 plants/acre or more, but as other studies have shown, lower seeding rates often can be used without a yield penalty.

Table 1. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 planter trials on corn.

Exp. no.	Trial	County	Hybrid	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160503	1	Story	Agrigold 6559	30	4/15/16	34,000	Soybean	Spring field cultivated
160113	2	Lyon	Pioneer PO339	22	5/12/16	VR 37,000	Corn	Conventional
160821	3	Howard	LG 5470	30	4/27/16	34,100	Corn	No-till
160110	4	Sioux	Pioneer PO533AM1	30	4/26/16	34,000	Soybean	Conventional
160105	5	Sioux	Pioneer PO157AM	30	5/16/16	28,000, 32,000, 36,000	Soybean	Conventional
160132	6	Lyon	Dekalb DK5284 & DK 5261	30	5/2/16	29,000 32,000, 35,000 38,000	Soybean	Conventional
160305	7	Monona	LG2549VT2	30	5/6/16	28,000 32,000, 36,000	Soybean	No-till
160134	8	Lyon	Wensman W1011	30	5/18/16	34,000	Soybean	No-till
160306	9	Monona	Wyffels 7456VT2	30	5/6/16	28,000 32,000, 36,000	Soybean	No-till

Table 2. Variety, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 planter trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160410	1	Kossuth	LG 2259LL	15 & 30	5/22/16	150,000	Corn	No-till
160825	2	Bremer	IA 2067	15 & 30	5/12/16	142,000	Corn	No-till
160103	3	Sioux	Pioneer P18T85R & 27T03R	30	5/5/16 & 5/21/16	100,000 & 125,000 & 150,000	Corn	No-till
160114	4	Lyon	Asgrow 1935	22	5/17/16	100,000 & 132,000	Corn	Conventional
160208	5	Pocahontas	Syngenta S 25L-9	30	5/17/16	154,000 & 165,000	Corn	Chisel, field cultivate
160705	6	Henry	Pioneer P28T08	30	4/26/16	132,000 & 155,000	Corn	Fall chisel, spring field cultivate

Table 3. Yields for on-farm corn planter trials in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160503	1	Row 1	258 a	<0.01
		Row 2	243 b	
		Row 3	246 b	
		Row 4	238 b	
		Row 5	248 ab	
		Row 6	240 b	
		Row 7	241 b	
		Row 8	245 b	
		Row 9	240 b	
		Row 10	243 b	
		Row 11	242 b	
		Row 12	242 b	
		Row 13	242 b	
		Row 14	240 b	
		Row 15	244 b	
		Row 16	242 b	
160113	2	Corn planted at 8 mph	244 a	0.08
		Corn planted at 6 mph	238 a	
160821	3	Corn planted at 7.5 mph	208 a	0.28
		Corn planter at 6.5 mph	223 a	
		Corn planted at 5.5 mph	202 a	
160110	4	Precision planting E-set plates	248 a	0.18
		John Deere 30 cell plates	252 a	
160105	5	Corn planting population of 28,000 seeds/ac	223 a	0.06
		Corn planting population of 32,000 seeds/ac	237 a	
		Corn planting population of 36,000 seeds/ac	235 a	
160132	6	Corn planting population of 28,000 seeds/ac	202 a	0.48
		Corn planting population of 32,000 seeds/ac	206 a	
		Corn planting population of 36,000 seeds/ac	202 a	
160305	7	Corn planting population of 28,000 seeds/ac	224 a	0.46
		Corn planting population of 32,000 seeds/ac	228 a	
		Corn planting population of 36,000 seeds/ac	233 a	
160134	8	Corn planted in center 12 rows	229 a	0.21
		Corn planted in outside 12 rows	224 a	
160306	9	Dekalb DK5284 at 29,000 seeds/ac	235 a	0.41
		Dekalb DK5261 at 29,000 seeds/ac	226 a	
		Dekalb DK5284 at 32,000 seeds/ac	230 a	
		Dekalb DK5261 at 32,000 seeds/ac	228 a	
		Dekalb DK5284 at 35,000 seeds/ac	231 a	
		Dekalb DK5261 at 35,000 seeds/ac	225 a	
		Dekalb DK5284 at 38,000 seeds/ac	227 a	
		Dekalb DK5261 at 38,000 seeds/ac	230 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 4. Yields for on-farm soybean planter trials in 2016.

Exp. no	Trial	Treatment	Fall stand count (plants/ac)[a]	Yield (bu/ac)[a]	P-value (yield)[b]
160410	1	30-in. row spacing		60 a	0.42
		15-in. row spacing		62 a	
160825	2	30-in. row spacing		56 a	0.02
		15-in. row spacing		53 b	
160103	3	Early maturing variety planted early at 100,000 seeds/ac		82 ab	<0.01
		Early maturing variety planted early at 125,000 seeds/ac		85 a	
		Early maturing variety planted early at 150,000 seeds/ac		85 a	
		Early maturing variety planted late at 100,000 seeds/ac		76 cdef	
		Early maturing variety planted late at 125,000 seeds/ac		78 bcde	
		Early maturing variety planted late at 150,000 seeds/ac		79 bcd	
		Late maturing variety planted early at 100,000 seeds/ac		75 cdef	
		Late maturing variety planted early at 125,000 seeds/ac		77 cdef	
		Late maturing variety planted early at 150,000 seeds/ac		80 abc	
		Late maturing variety planted late at 100,000 seeds/ac		71 f	
		Late maturing variety planted late at 125,000 seeds/ac		73 ef	
		Late maturing variety planted late at 150,000 seeds/ac		73 def	
160114	4	Planting population of 100,000 seeds/ac		84 a	0.68
		Planting population of 132,000 seeds/ac		83 a	
160208	5	Planting population of 154,000 seeds/ac	146,800 a	67 a	0.84
		Planting population of 164,000 seeds/ac	158,900 b	67 a	
160705	6	Planting population of 132,000 seeds/ac		72 a	0.48
		Planting population of 150,000 seeds/ac		71 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.

On-Farm Cover Crop Trials

RFR-A1662

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Introduction

Cover crops can benefit farmers by aiding in soil erosion control, increasing organic matter in the soil, and reducing nitrate losses into the surface waters. Cover crops also have been promoted to alleviate soil compaction and improve soil drainage. Cover crops are an important practice in meeting Iowa's nutrient reduction strategy goals. However, some research has indicated that planting corn following a rye cover crop can result in corn grain yield reduction, especially if the cover crop is not killed at least two weeks prior to planting the corn. The objective of these trials was to evaluate whether a cover crop would affect corn and soybean yield.

Materials and Methods

In 2016, cover crop use was examined in two trials in corn and two trials in soybean (Table 1). All trials were conducted on-farm by farmer cooperators, except Trial 1, which was conducted at the ISU Allee Farm. 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, one bushel/acre of rye was no-till drilled in mid-October 2015 following a soybean harvest. The cover crop was sprayed with glyphosate when it was about 18 in. tall on May 19, 2016. Soybeans were planted three days later. In Trials 2 and 3, 30 lb/acre rye and 85 lb/acre radish cover crop was seeded by air on September 1, 2015 into standing soybeans. The cover crop was killed with glyphosate when the plants were 6-10 in. tall, two weeks before planting the corn. In Trial 4, 20 lb/acre red clover was seeded on May 15, 2016 into corn at the V5 growth stage. The cover crop will be killed in 2017 prior to soybean planting. Corn and soybean without a cover crop was compared with the crops planted after a cover crop in all trials.

Results and Discussion

In Trials 1 and 3, the cover crop had no effect on soybean yield (Table 2). In Trial 2, the corn planted following a rye/radish cover crop yielded 15 bushels/acre more than the corn planted without a cover crop ($P = 0.03$). It is not known what caused the yield increase, although it is possible it could be due to decreased soil compaction and/or increased water infiltration. In Trial 4, there was a yield increase of four bushels/acre with the red clover cover crop seeded into corn at V5 ($P = 0.03$). It is unknown what caused this yield increase. The results of these trials indicate corn and soybean can be planted following a rye, rye/radish, or red clover cover crop without hurting the yield, and can result in yield increases.

Table 1. Variety, row spacing, planting date, planting population, previous crop, and tillage practices from cover crop trials in corn and soybean in 2016.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage practices
160212	1	Buena Vista	Syngenta 22S1	30	5/21/16	140,000	Corn	No-till
160803	2	Bremer	NuTech 5F-707AM	30	4/21/16	32,500	Soybean	No-till
160827	3	Bremer	NuTech 7233	30	5/21/16	160,000	Corn	No-till
160663	4	Adair	Pioneer PO937	30	5/19/16	35,000	Soybean	Chisel plow & disc

Table 2. Yield from on-farm cover crop in corn and soybean trials in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160212	1	1 bu/ac rye cover crop seeded on 10/16/15	74 a	0.69
		No cover crop	74 a	
160803	2	30 lb/ac rye and 85 lb/ac radish cover crop seeded on 9/1/15	225 a	0.03
		No cover crop	210 b	
160827	3	30 lb/ac rye and 85 lb/ac radish cover crop seeded on 9/1/15	56 a	0.30
		No cover crop	54 a	
160663	4	20 lb/ac red clover seeded on 6/15/16 in V5 corn	177 a	0.03
		No cover crop	173 b	

[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.

On-Farm Corn and Soybean Seed Treatment Trials

RFR-A1663

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Introduction

Seed treatments offer protection to germinating seeds and developing seedlings from fungi, insects, and nematodes. All legumes require the appropriate rhizobium bacteria in the soil in order for nitrogen fixation to occur. Inoculating the seed with an inoculum can insure the crop will take advantage of this nitrogen fixation.

Materials and Methods

In 2016, seven trials (Table 1) examined the use of corn and soybean seed treatments to increase yield. All trials were conducted on-farm by farmer cooperators using the farmer's equipment. Seed treatments were applied with the planter and arranged in a randomized complete block design with at least three replications per treatment. Plot size varied from field to field depending on equipment size and the size of the field. All plots were machine harvested for grain yield.

In Trial 1, soybean planted with soybean seed treated with the insecticide Incumbus was compared with soybean planted with untreated seed (Table 2). In Trials 2 and 3, corn treated with the biological seed treatment Tri-Core PGP was compared with untreated corn seed. In Trial 4, soybean seed treated with Innovate™ plus Bioboost® was compared with untreated soybean planted with seed. Innovate is an insecticide/fungicide combination and Bioboost® is an inoculant. In Trial 5, soybean seed treated with Quickroots® seed treatment was compared with untreated soybean seed. In Trial 6, soybean seed treated with Cruiser Maxx® was compared with soybean seed treated with Clariva®. Cruiser Maxx® contains an insecticide and two fungicides. Clariva® is a nematicide. In Trial 7, soybean seed treated with Acceleron® fungicide seed treatment was compared with untreated soybean seed. Acceleron® and Quickroots® are marketed by Monsanto.

Results and Discussion

There was a small but significant soybean yield increase with the Incumbus insecticide seed treatment in Trial 1 ($P = 0.10$), and a small but significant soybean yield decrease with the Acceleron® fungicide seed treatment in Trial 7 ($P = 0.06$). The yield increase with the Incumbus may have been due to reduced insect feeding. It is not known why the Acceleron® may have resulted in a yield decrease. The Tri-Core PGP biological seed treatment did not have any affect on corn yield in Trials 2 and 3. It is marketed by Direct Biologicals as a blend of bacteria and fungi that create biofilms around root systems, which allows nutrient release and prevents plant pathogens.

In Trial 4, soybean seed treated with Innovate plus Bioboost® yielded two bushels/acre more than the untreated soybeans. It is not known whether the yield increase was due to the insecticide and/or fungicide in the Innovate, and/or the inoculant in the Bioboost®. Most research has indicated grain yield increases are seldom seen when soybean seed is treated with an inoculant, unless the field has not been planted to soybean for at least five years. Because this field had a corn-soybean rotation history, it is unlikely the yield increase was due to the inoculant.

In Trial 5, there was no effect on soybean yield with the soybean seed treated with Quickroots®. Quickroots® is marketed as a microbial seed inoculant that improves availability of nutrients. In Trial 6, there was no difference in yield between soybean treated with CruiserMax® and soybean treated with Clariva®. Because there was not an untreated seed treatment in this trial, it is not known whether either resulted in a yield increase.

Table 1. Variety, row spacing, planting date, planting population, and previous crop in on-farm seed treatment trials in corn and soybean in 2016.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop
160804	1	Bremer	Pioneer P0937AM	30	5/12/16	130,000	Corn
160116	2	Lyon	Dekalb DK5063	30	5/6/16	34,500	Corn
160117	3	Lyon	Croplan 2450	15	5/18/16	150,000	Corn
160124	4	Lyon	Stine 23LF32	20	5/20/16	134,000	Corn
160411	5	Kossuth	LG 2259LL	30	5/22/16	150,000	Corn
160403	6	Franklin	Syngenta S26-P3	30	5/15/16	145,000	Corn
160704	7	Washington	Stine 31RF02	30	5/24/16	140,000	Corn

Table 2. Yield from on-farm seed treatment trials in corn and soybean in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160804	1	Incumbus seed treatment	50 a	0.10
		Control	49 a	
160116	2	Tri-Core PGP biological seed treatment at 1.375 g/ac	215 a	0.33
		Control	208 a	
160117	3	Tri-Core PGP biological seed treatment at 1.375 g/ac	235 a	0.67
		Control	234 a	
160124	4	Innovate at 3qt/40 units plus BioBoost at 1.2 oz/bag	74 a	0.04
		Control	72 b	
160411	5	Control	62 a	0.44
		Quickroots biological seed treatment	61 a	
160403	6	Cruiser Max	58 a	0.68
		Clariva	59 a	
160704	7	Control	68 a	0.06
		Acceleron seed treatment	67 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.