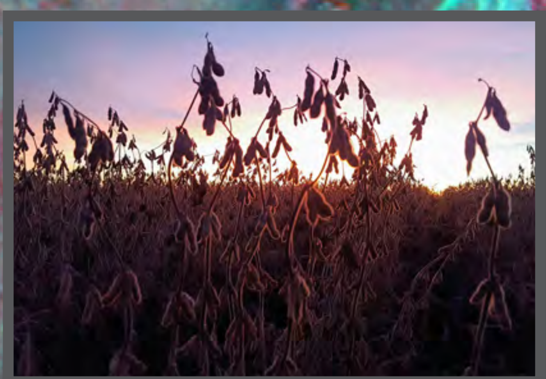
NEBRASKA ON-FARM RESEARCH NETWORK



2015 GROWING SEASON RESULTS

Post-Conference Publication March 2016

UNIVERSITY OF Nebraska Lincoln®

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NEBRASKA ON-FARM RESEARCH NETWORK

2015 GROWING SEASON RESULTS

Feb. 8 - West Central Research and Extension Center, North Platte

Feb. 9 - Hall County Ext. Office, College Park Campus, Grand Island

Feb. 11 - Lifelong Learning Center, Northeast Community College, Norfolk

Feb. 12 - Agricultural Research and Development Center, near Mead

Sponsored by:

N EXTENSION

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Nebraska CornBoard

NEBRASKA CORN GROWERS ASSOCIATION

NEBRASKA SOYBEAN CHECKOFF

University of Nebraska–Lincoln Institute of Agriculture and Natural Resources

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NEBRASKA ON-FARM RESEARCH NETWORK Resource Directory

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on-farm research project listed in this report.

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In production ag it's what you think you know, that you really don't know, that can hurt you.

Why On-Farm Research?

On-farm research has many variants and approaches. It is research that you do on your field(s) using your equipment and normal production practices. This means the research is directly applicable to your operation. The Nebraska On-Farm Research Network approaches topics that are critical farmer production, profitability and natural resources questions, such as:

- Nutrient management
- Pest control
- Irrigation Strategies
- Conservation programs
- New technologies
- Soil amendments
- Cultural practices
- Hybrid and variety selection

About the Research

- Comparisons are identified and designed to answer producers' production questions.
- Projects protocols are developed first and foremost to meet individual cooperator needs.
- Only projects that are randomized, replicated and harvested accordingly are reported.
- Multiple year comparisons are encouraged.

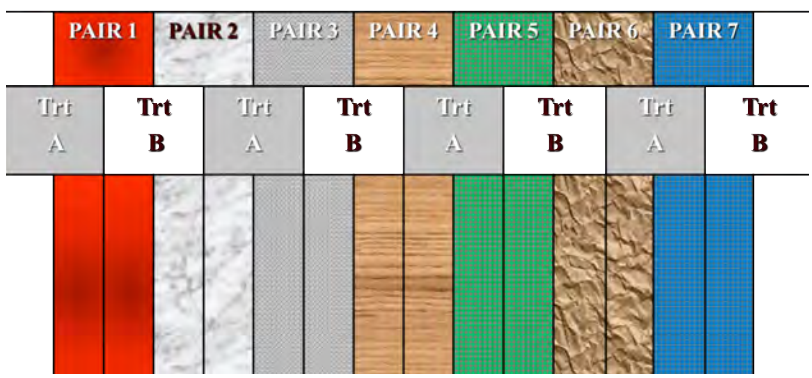
Statistics 101

Replication: In statistics, replication is repetition of an experiment or observation in the same or similar conditions. Replication is important because it adds information about the reliability of the conclusions or estimates to be drawn from the data. The statistical methods that assess that reliability rely on replication.

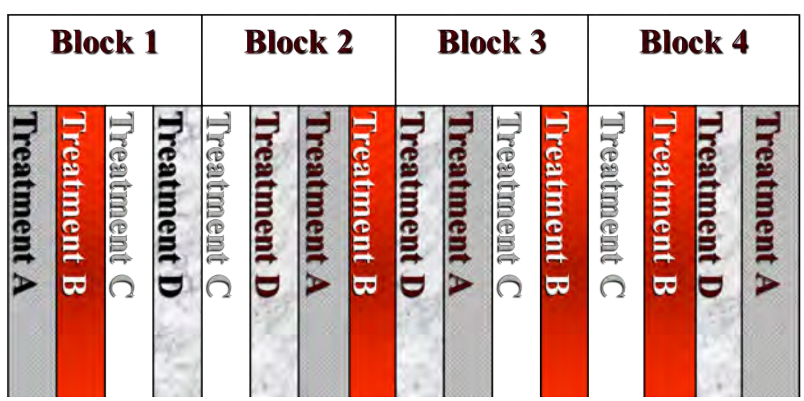
Randomization: Using random sampling as a method of selecting a sample from a population in which all the items in the population have an equal chance of being chosen in the sample. Randomization reduces the introduction of bias into the analysis.

What is the P-value? The P-Value reported for each study is the calculated probability that the differences found in the study are due to chance. As the P-Value number gets smaller, the probability increases that there are real differences. This helps differentiate between random variation and real treatment effects. For these studies we use a P-Value of 0.1 as the cutoff to determine whether the treatment differences are greater than random variation (sometimes called experimental error). When the differences are thought to be real we call them significant. If the P-Value is less than 0.1 we know that there is 10% or less chance that the yield differences are due to random variation. If this is the case, the letters following yield figures are different to show the statistical difference. As the P-Value increases the differences are more and more likely due to chance. In this book treatment data that is not different (P-Values are greater than 0.1) are followed by the same letter. We have chosen 0.1 as the point where we are confident that our yield differences are due to the treatments and not other factors, however this is an arbitrary cut-off. In cases where it does not cost anything to switch treatments, such as when varieties cost the same, a different cut-off level could be chosen.

Paired comparison design



Randomized complete block design



Unless otherwise noted, data in this report were analyzed using Statistixs 10.0 Analytical Software and means were separated using Tukey's HSD (honest significant difference) test.

Profit Calculation

Many of our studies include a net return calculation. It is difficult to make this figure applicable to every producer. In order to calculate revenue for our research plots we use input costs provided by the producer, application costs from Nebraska Extensions 2014 Nebraska Farm Custom Rates – Part 1 and 2 (EC823 and EC826), and an average commodity market price for 2015.

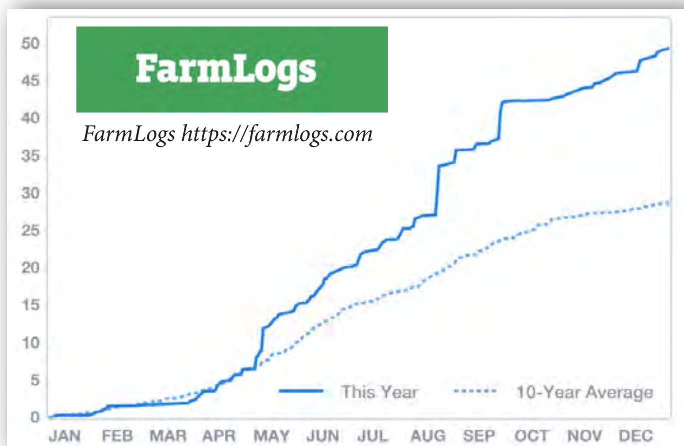
Average market commodity prices for the 2015 report are:

Corn: $3.65/bu
Soybeans: $8.90/bu
Wheat: $5.00/bu
Sorghum: $3.60/bu
Dry Edible Beans: $20/cwt
($12/bu @ 60lb/bu)
Popcorn: $0.19/lb

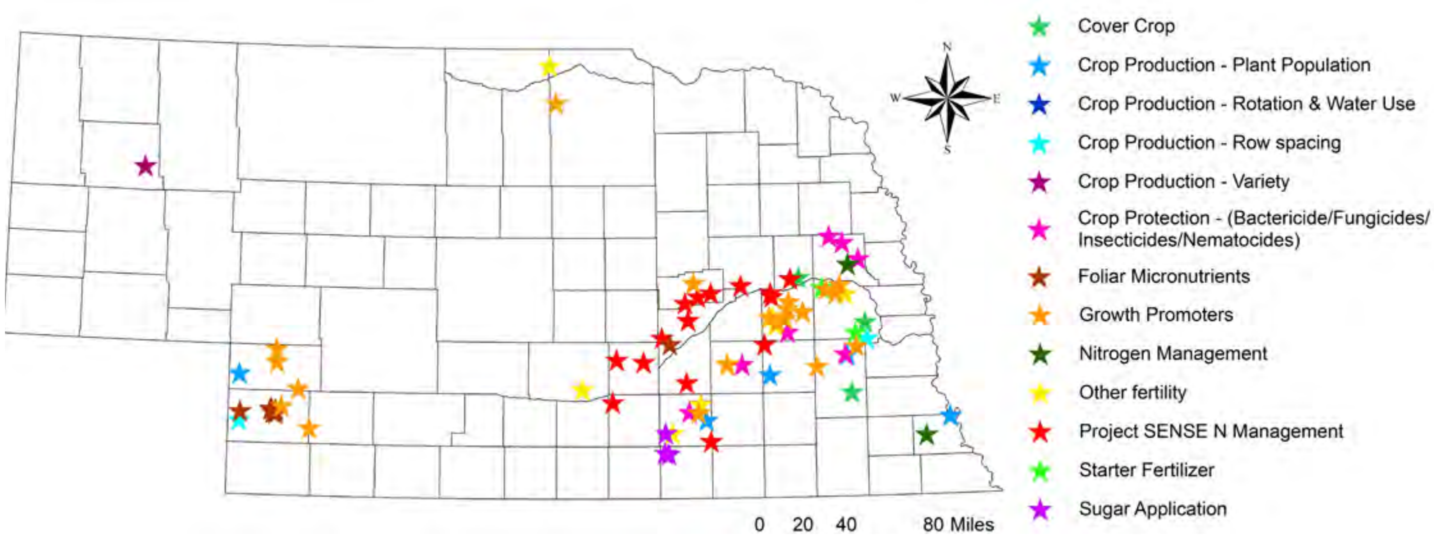
In order to make this information relevant to your operation, you may need to refigure return per acre with costs that you expect.

Rainfall Data

Rainfall data is provided for each study based on the field location. The rainfall graphs are developed using data from National Weather Service radar and ground stations that are 2 km accurate.

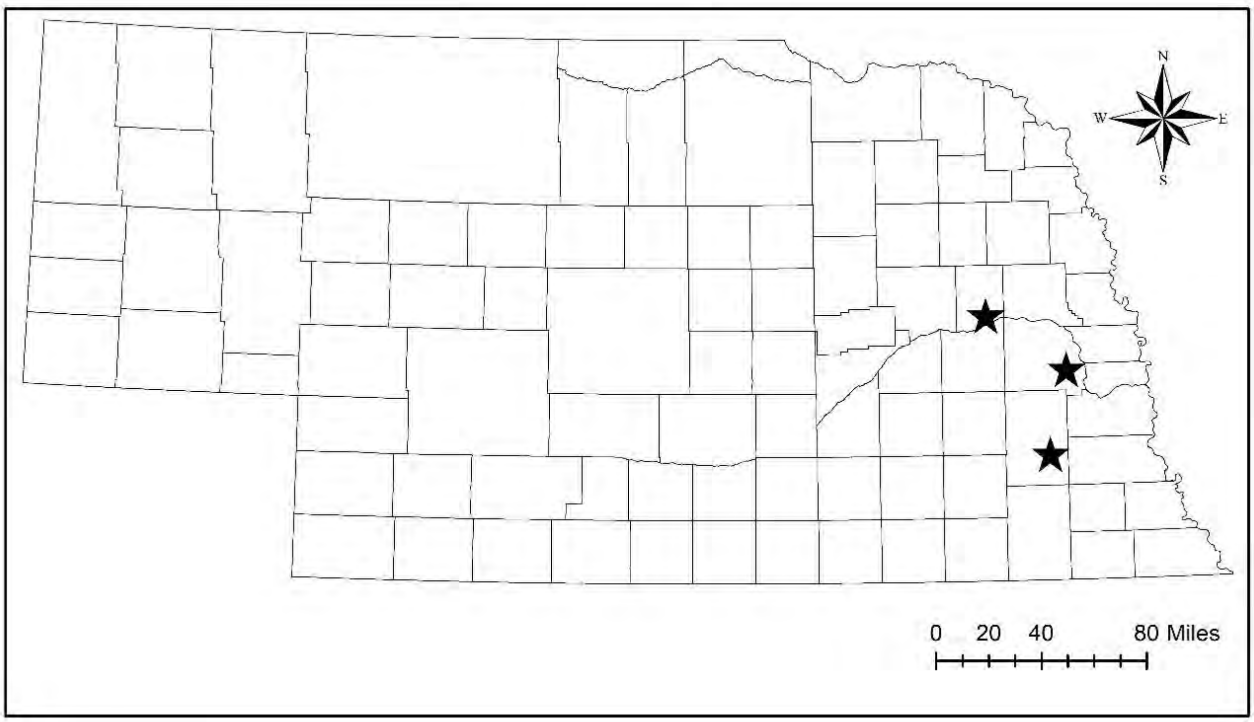


2015 Study Locations



COVER CROPS

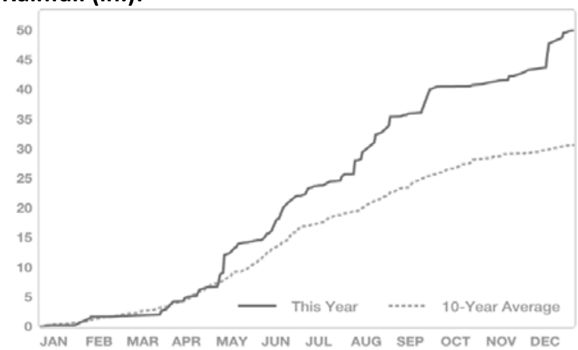
- Corn Planted into Grazed and Non-Grazed Cover Crop
- Corn Planted into Rye and Winter Mix Cover Crop
- Corn Planted into Wheat Cover Crop and Wheat plus Radish Cover Crop



Corn Planted into Grazed and Non-Grazed Cover Crop

Study ID: 025155201501
County: Saunders
Soil Type: Tomek silt loam; Yutan silty clay loam;
Planting Date: 4/30/15
Harvest Date: 11/5/15
Population: 25,994
Row Spacing (in.) 30
Hybrid: Pioneer P1257AM
Reps: 3
Previous Crop: Wheat
Tillage: Tilled twice – once after manure application and once before cover crop seeding.
Herbicides: ***Pre:*** 1 lb/ac Atrazine 90 DF, 32 oz/ac Buccaneer Plus, 3.5 oz/ac Corvus, 2 lb/ac AMS, and 1.2 pt/ac MSO on 5/1/15 ***Post:*** 1 pt/ac Atrazine 4L, 32 oz/ac Buccaneer, 3 oz/ac Laudis, 2 lb/ac AMS, and 1.19 pt/ac MSO on 6/9/15

Fertilizer: 28 ton/acre manure applied post wheat harvest, summer 2014.
No additional fertilizer applied
Note: Fall 2014 Weed Control (No Cover Crop Area Only)
9/29/14 Roundup PowerMax 30oz/ac + AMS 3lb/ac
Irrigation: None
Rainfall (in.):



Introduction: This study looked at the effects of a cover crop following wheat on the subsequent corn yield. Wheat was harvested in summer 2014 and straw was baled and removed, then 28 ton/acre manure slurry was applied. The field was tilled twice, once after the manure application and once before seeding the cover crop. This study included three treatments: corn planted into no cover crop (check), corn planted following cover crop, and corn planted following a grazed cover crop. The cover crop used in this study was a mix of 3 lb/ac daikon radish (30%), 15 lb/ac oats (13%), 3 lb/ac purple top turnip (60%), 5 lb/ac sorghum (17%), and 4 lb/ac safflower (44%). The cover crop was seeded at a rate of 27 lb/acre on August 15, 2014 and was winter killed. The no-cover crop treatment had an additional fall herbicide application to control weeds in these strips. The application was 30 oz/ac Roundup PowerMax and 3 lb/ac AMS on Sept. 29. For the grazed treatment, steer calves were stocked at a rate of 1 calf per ton of above ground biomass (excluding radish and turnip tubers), which was equal to 1.7 calves per acre (995 lb BW/ac). Calves grazed for 52 days in 2014. The initial BW was 585 ± 8 lb. Ending BW was 664 ± 30 lb. Overall, ADG was 1.55 ± 0.57 lb/d and gain per acre was 137 ± 6 lbs/acre. Total forage biomass was approximately 2.39 ± 0.44 tons per acre (above ground biomass = 1.76 ± 0.31 tons/acre; below ground biomass = 0.70 ± 0.34 tons/acre). Above ground biomass accounted for 74% of the total biomass produced. In 2014, the radish produced the most biomass, accounting for 60% of the total biomass, followed by turnip at 17%, oats at 16%, and sorghum at 10%. Safflower was not detectable. Corn was planted into all three treatments on April 30, 2015. This study compared grain yield of corn planted into wheat stubble (check), planted into grazed cover crop, and planted into non-grazed cover crop.

Figure 1: Aerial image of cover crop study area on Oct. 14, 2014.

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Check	236 A*	14.2 A	845.07
Cover Crop-Non-Grazed	211 B	14.2 A	728.35
Cover Crop-Grazed	227 AB	14.3 A	978.50
P-Value	0.0337	0.1423	N/A

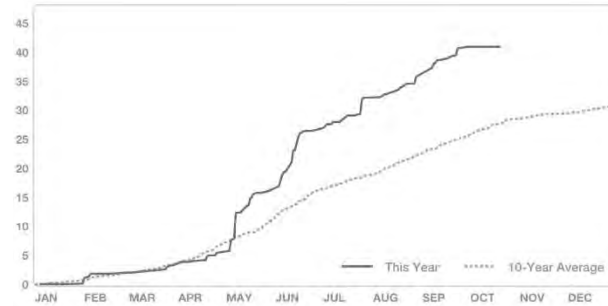
†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $28.43/ac cover crop seed cost, and $13.37/ac drill application cost. Cost of additional fall herbicide application to non-cover crop treatment was $8.21/ac for products and $8.12/ac for application. Calf price in 2014 was $1579 for the starting calf weight and $1784 for the ending calf weight. With calves gaining 79 lb, there was a gain of $125/calf or $213/ac. With the cost of fencing and labor to provide water and check cattle at $12.50/calf ($21.25/ac), the net income for the calves would be 191.75.

Summary: The non-grazed cover crop treatment was significantly lower than the check. There was no significant difference between the grazed cover crop treatment and the check. It is speculated that lower corn yields on the ungrazed plots may be due to nitrogen tie up by the forage cover crop. Soil tests are planned for spring of 2016 to further evaluate this. With the additional income for the cattle, the grazed cover crop treatment was most profitable.

Corn Planted into Rye and Winter Mix Cover Crop

Study ID: 119109201501
County: Lancaster
Soil Type: Wymore silty clay loam; Colo-Nodaway silty clay loam; Mayberry silty clay loam;
Planting Date: 4/29/15
Harvest Date: 10/19/15
Population: 25,560
Row Spacing (in.) 30
Hybrid: unknown
Reps: 4
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** unknown ***Post:*** unknown

Note: Barren Stalks noticable, significant Waterhemp pressure
Irrigation: None
Rainfall (in.):



Soil Samples (2013):

	Soil	Buffer												% Base Saturation			
ID	**pH**	**pH**	**OM**	**NO3**	**Bray I P**	**K**	**Mg**	**Ca**	**Na**	**S**	**Zn**	**CEC**	**H**	**K**	**Mg**	**Ca**	**Na**
			%	ppm	ppm	------------------ppm--------------------							--------------%--------------				
1	5.9	6.4	3.5	5.3	50	267	500	3342	25	6	2.3	28.7	24.4	2.4	14.5	58.3	0.4
2	6.3	6.6	3.8	7.3	111	268	429	3333	22	4	6.2	26.0	19.2	2.6	13.7	64.0	0.4

Introduction: This study is looking at the effects of a cover crop on the subsequent cash crop. This is a continuation of a similar effort, however this is the first year for cover crops on this part of the field. Following wheat harvest In summer of 2014, prior to seeding the cover crop, 8 lb/ac of 90% sulfur, approximately 50 lb/ac potash, and 3,000 lb/ac ag lime were applied. Soil samples from 2013 are shown above. After the cover crop was seeded, 5 ton/acre chicken manure was applied. Manure analysis is below. There were three treatments in this study: no cover crop, cereal rye cover crop, and a winter mix cover crop. Cereal rye was seeded at 1 bu rye/acre. The winter mix was seeded at 40.75 lb/ac and included 7.5 lb/ac winter pea, 3.75 lb/ac hairy vetch, 3 lb/ac common vetch, 3 lb/ac lintels, 22 lb/ac winter wheat, 0.75 lb/ac rape seed, 0.75 lb/ac Winfred Hybrid. Cover crops were seeded into wheat stubble on August 19, 2014. Cover crop was killed April 22, 2015 using the farmer's standard burndown herbicide program, therefore the cost of herbicide is not included in the marginal net return calculations. Corn was planted April 29.

Manure Analysis			
	Analysis Dry Basis	**Nutrients lbs\ Ton Dry Basis**	**Nutrients lbs/Ton As Received**
Organic Nitrogen, %N	7.46	149.2	80.7
Ammonium, % N	0.537	10.7	5.8
Nitrate, % N	<.001	0	0
Total N (TKN), % N	8.00	159.9	86.5
Phosphorus, % P205	4.33	86.7	46.9
Potassium, % K20	3.18	63.6	34.4
Sulfar, % S	0.73	14.7	7.9
Calcium, % Ca	10.38	207.7	112.4
Magnesium, % Mg	0.55	11.1	6
Sodium, % Na	0.58	11.7	6.3
Sodium Adsorption Ratio	4.77	--	--
Zinc, ppm Zn	381.80	0.8	0.4
Iron, ppm Fe	339.60	0.7	0.4
Manganese, % ppm Mn	343.30	0.7	0.4
Copper, ppm Cu	268.90	0.5	0.2
Soluble Salts, mmho/cm	44.65	57.2	30.9
pH	7.20	--	--
Moisture, %	45.90	--	--
Dry Matter, %	54.10	--	--

Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac)‡
Check	172 A*	16.6 A	26,100 A	$627.80
Cover Crop – Rye	155 A	16.4 A	24,650 A	$537.88
Cover Crop – Winter Mix	158 A	16.5 A	26,100 A	$492.33
P-Value	0.1486	0.8852	0.3465	N/A

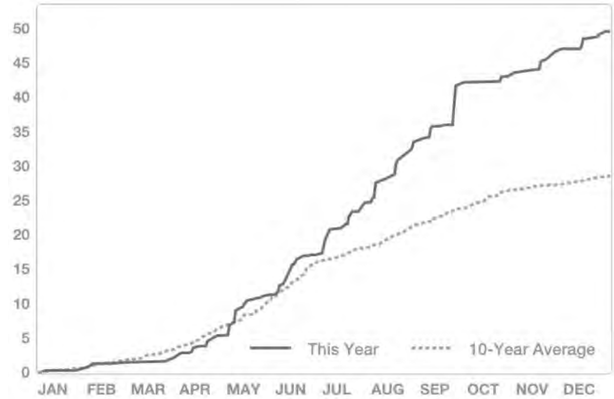
†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $14.50/acre cereal rye seed cost, $71.00/acre winter mix seed cost (a large portion of this cost was due to freight for shipping), and $13.37/acre drill application cost.

Summary: There was no significant grain yield difference between the no cover crop treatment, cereal rye, and winter cover crop mix. Net return was less for both the cereal rye cover crop and winter mix cover crop.

Corn Planted into Wheat Cover Crop and Wheat plus Radish Cover Crop

Study ID: 223037201501
County: Colfax
Soil Type: Beldon fine sandy loam; Shell silt loam; Zook silty clay loam;
Planting Date: 5/19/15
Harvest Date: 11/4/15
Population: 35,000
Row Spacing (in.) 30
Hybrid: Hoegemeyer 8294
Reps: 4
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** Bicep and Roundup (32oz) on 4-28-2015 ***Post:*** Unknown
Seed Treatment: Standard
Foliar Insecticides: none
Foliar Fungicides: none
Fertilizer: 18 gal 10-34-0 dribbled on top 2" from seed trench 32% @187 lbs/ac sidedress with no-till applicator on 6-23-2015

Irrigation: Pivot, Total: 7.0"
Rainfall (in.):



Introduction: Cover crop was planted 10/21/2014 following soybean harvest. Wheat cover crop was seeded at a rate of 1 bu/ac. Wheat plus radish treatment had a seeding rate of 1 bu/ac for the wheat and 3.75 lb/ac for the radish. Plots were randomized. Cover crops were seeded at 1" depth. Radish did not establish well in the fall, however the wheat stand was good.

The field was sprayed on 4/28/15 with Bicep and 32 oz/ac Roundup to kill the cover crop. This herbicide application is part of the farmer's standard practice, therefore an additional cost of herbicide was not charged to the cover crop treatment. Corn was planted on 5/19/15.

Results:

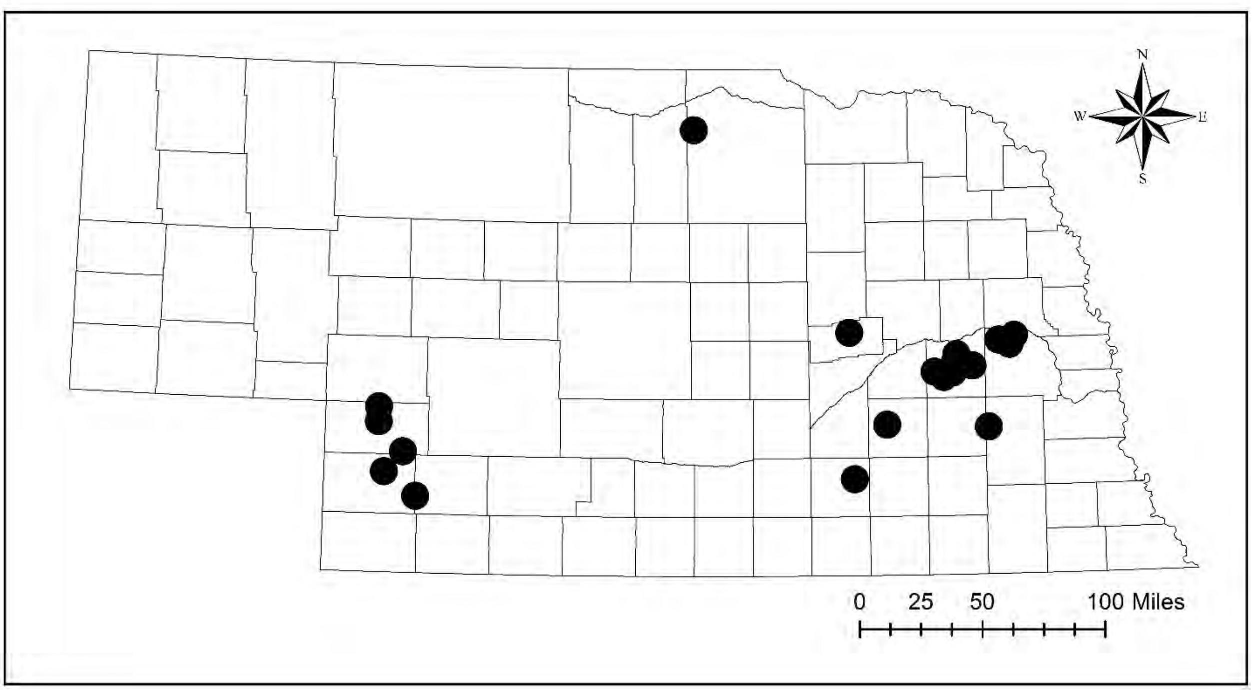
	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Check	235 A*	14.3 A	$857.75
Cover Crop - Wheat	238 A	14.0 A	$846.33
Cover Crop - Wheat and Radish	238 A	14.3 A	$836.35
P-Value	0.4032	0.1566	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $9.00/bu wheat seed cost, $2.66/lb radish seed cost, and $13.37/acre drill application cost.

Summary: There was no grain yield difference for the corn planted into bean stubble, wheat cover crop, or wheat plus radish cover crop. Because of the increased cost of cover crop seed and drill application for the two cover crop treatments, the net return was lower for the cover crop treatments than for the check.

GROWTH PROMOTERS

- Aegis® ESR on Popcorn
- Aegis® ESR on Irrigated Corn – 3 locations
- Aegis® ESR on Dryland Corn – 3 locations
- Torque® on Corn
- QuickRoots™ on Corn
- SoilSet™ at planting on Soybeans
- RyzUp SmartGrass® Applied with Herbicides to Soybeans – 3 locations
- RyzUp SmartGrass® on Corn – 2 locations
- Surfactants and RyzUp SmartGrass® on on Big Bluestem
- Surfactants and RyzUp SmartGrass® on Smooth Brome – 3 locations
- Fall Applied RyzUp SmartGrass® on Smooth Brome

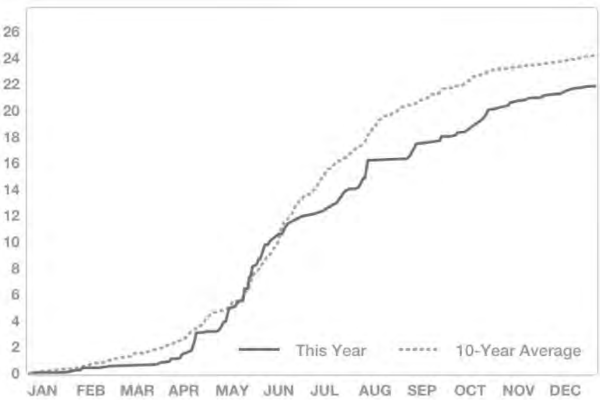


Aegis® ESR on Irrigated Popcorn at VT

Study ID: 190029201501
County: Chase
Soil Type: Valent loamy sand; Jayem loamy fine sand; Haxtun fine sandy loam;
Planting Date: 5/4/15
Harvest Date:
Population: 29,000
Row Spacing (in.) 15
Hybrid: 427
Reps: 8
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** Lumax at label rate on 5/6/15
Post: 4 oz/ac Status on 6/18/15
Seed Treatment: Cruzer 250
Foliar Insecticides: Unknown
Foliar Fungicides: Quilt on 7/23/15

Fertilizer: 40 lb/ac 32-0-0 on 5/6/15
29 lb/ac 32-0-0 on 6/13/15, 6/29/15, 7/1/15, 7/8/15, and 7/22/15

Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on irrigated popcorn. Aegis® ESR was applied with an aerial application at a rate of 5 oz/acre at the VT growth stage. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product label with active ingredients is below.

Results:

	Yield (lb/ac)†	Marginal Net Return ($/ac)‡
Check	5,803 A*	1102.57
Aegis ESR	5,624 A	1055.06
P-Value	0.6932	N/A

†lbs/acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $0.19 corn, $4/acre Aegis ESR cost, and $9.50/ac application cost.

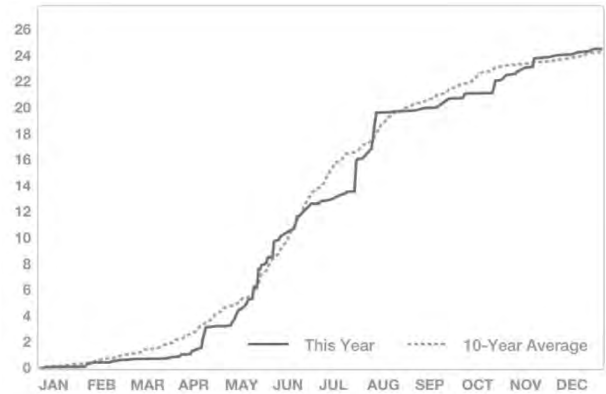
Summary: There was no significant yield difference between the Aegis® ESR treatment and the check. Marginal net return was lower for the Aegis® ESR treatment due to the increased cost of production which was not recovered.

This study was sponsored in part by: LTA Resource Management.

Aegis® ESR on Dryland Corn at V5

Study ID: 186085201501
County: Hayes
Soil Type: Blackwood silt loam;
Planting Date: 5/25/15
Harvest Date: unknown
Population: unknown
Row Spacing (in.) 30
Hybrid: unknown
Reps: 8
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** unknown ***Post:*** unknown
Seed Treatment: unknown
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Fertilizer: unknown
Irrigation: None
Rainfall (in.):



Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on dryland corn. Aegis® ESR was applied with a high clearance applicator at a rate of 5 oz/acre at the V5 growth stage. This product is expected to be applied with a post herbicide application. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product active ingredients are below.

Aegis® ESR

- PLANT GROWTH STIMULATOR
- PROTEIN ENHANCER

- AEGIS® ESR INCREASES THE INTAKE OF NUTRIENTS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE UTILIZATION OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE SYNTHESIS OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD

ACTIVE INGREDIENTS:
Sodium p-nitrophenolate 0.30%
Sodium o-nitrophenolate 0.20%
Sodium 5-nitroguaiacolate 0.10%
OTHER INGREDIENTS: 99.40%
TOTAL: 100.00%

This product contains 0.03 lbs. of sodium p-nitrophenolate, 0.02 lbs. of sodium o-nitrophenolate, and 0.01 lb. of sodium 5-nitroguaiacolate per gallon.

Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	148 A*	540.20
Aegis® ESR	149 A	539.85
P-Value	0.4751	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn and $4/acre Aegis® ESR cost.

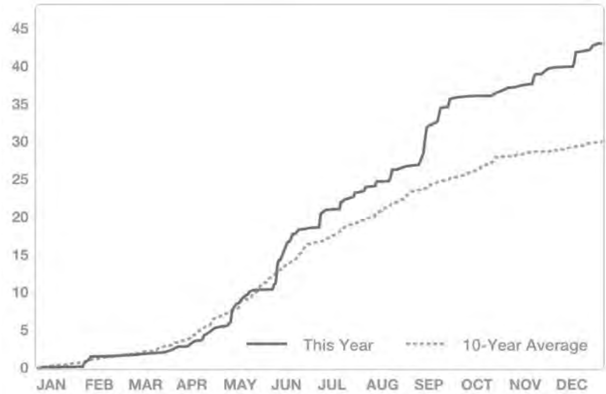
Summary: There was no significant yield difference between the Aegis® ESR treatment and the check. Marginal net return was lower for the Aegis® ESR treatment due to the increased cost of production which was not recovered.

This study was sponsored in part by: LTA Resource Management.

Aegis® ESR on Irrigated Corn at V5

Study ID: 026185201501
County: York
Soil Type: Hastings silt loam;
Planting Date: 4/24/15
Harvest Date: 10/20/15
Population: unknown
Row Spacing (in.) 30
Hybrid: Pioneer P1690 CHR
Reps: 8
Previous Crop: Corn
Tillage: Ridge-Till
Herbicides: ***Pre:*** 32 oz/ac RoundupPowerMax + 2/3 pt/ac 2,4-D LV6 on 4/13/15;
2.1 qt/ac Bicep II on 4/23/15 ***Post:*** 32 oz/ac Roundup PowerMax + 0.5 oz/ac Armezon on 6/9/15
Seed Treatment: unknown
Foliar Insecticides: 6.4 oz/ac Brigade on 4/24/15
Foliar Fungicides: 10.5 oz/ac Quilt Xcel on 7/31/15

Fertilizer: 230 lb/ac Anhydrous Ammonia on 3/20/15;
3 gal/ac 10-34-0 on 4/24/15
Irrigation: Pivot, Total: 5"
Rainfall (in.):



Soil Tests:

					Phosphorus (P)		Ammonium Acetate (ppm)						% Base Saturation				
ID	Soil pH 1:1	OM LOI-%	0-10" Nitrate (ppm)	11-24" Nitrate (ppm)	Weak Bray 1:7 (ppm)	Strong Bray 1:7 (ppm)	K	Ca	Mg	Ca-P Sulfate (ppm S)	Zn (ppm)	Sum of Cations (me/100g)	H	K	Ca	Mg	Na
1	6.4	2.6	6	-	36	69	263	2535	381	11	3.1	18.1	8.8	3.7	70.0	17.5	-
2	6.7	2.6	6	-	24	43	386	2094	342	14	1.6	14.3	0.0	6.9	73.2	19.9	-
3	7.0	2.3	8	-	35	114	553	2834	660	17	3.2	21.1	0.0	6.7	67.2	26.1	-

Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on irrigated corn. Aegis® ESR was applied with a high clearance applicator at a rate of 5 oz/acre at the V5 growth stage on 6/8/15. This product is expected to be applied with a post herbicide application. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product active ingredients are at right.

Aegis® ESR

- PLANT GROWTH STIMULATOR
- PROTEIN ENHANCER

- AEGIS® ESR INCREASES THE INTAKE OF NUTRIENTS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE UTILIZATION OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE SYNTHESIS OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD

ACTIVE INGREDIENTS:
Sodium p-nitrophenolate 0.30%
Sodium o-nitrophenolate 0.20%
Sodium 5-nitroguaiacolate 0.10%
OTHER INGREDIENTS: 99.40%
TOTAL: 100.00%

This product contains 0.03 lbs. of sodium p-nitrophenolate, 0.02 lbs. of sodium o-nitrophenolate, and 0.01 lb. of sodium 5-nitroguaiacolate per gallon.

Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac)‡
Check	247 A*	18.5 A	31,063 A	901.55
Aegis ESR	246 A	18.3 A	31,188 A	893.90
P-Value	0.5547	0.1966	0.7849	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn, $4/acre Aegis ESR cost.

Summary: There was no significant yield difference between the Aegis® ESR treatment and the check. Marginal net return was lower for the Aegis® ESR treatment due to the increased cost of production which was not recovered.

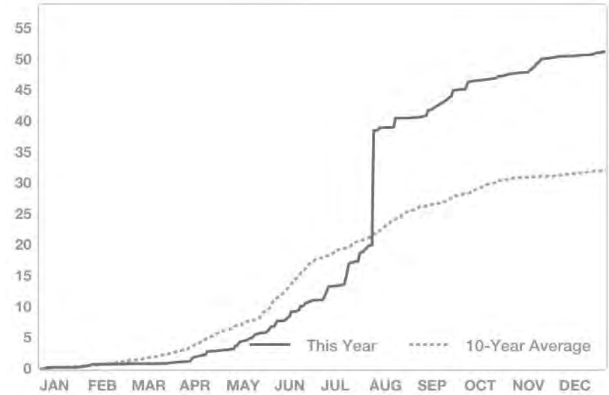
This study was sponsored in part by: LTA Resource Management.

Aegis® ESR on Irrigated Corn at V5

This study was conducted by the Stuart FFA as part of the Innovative Youth Corn Challenge.

Study ID: 219089201501
County: Holt
Soil Type: Valentine fine sand;
Planting Date: unknown
Harvest Date: unknown
Population: 34,000
Row Spacing (in.) 30
Hybrid: Dekalb 55-20
Reps: 5
Previous Crop: Unknown
Tillage: Unknown

Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on irrigated corn. Aegis® ESR was applied with a high clearance applicator at a rate of 5 oz/acre at the V5 growth stage. This product is expected to be applied with a post herbicide application. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product label with active ingredients is below.

Aegis® ESR

- PLANT GROWTH STIMULATOR
- PROTEIN ENHANCER

- AEGIS® ESR INCREASES THE INTAKE OF NUTRIENTS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE UTILIZATION OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE SYNTHESIS OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD

ACTIVE INGREDIENTS:	
Sodium p-nitrophenolate	0.30%
Sodium o-nitrophenolate	0.20%
Sodium 5-nitroguaiacolate	0.10%
OTHER INGREDIENTS:	99.40%
TOTAL:	100.00%

This product contains 0.03 lbs. of sodium p-nitrophenolate, 0.02 lbs. of sodium o-nitrophenolate, and 0.01 lb. of sodium 5-nitroguaiacolate per gallon.

Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Results:

	Yield (bu/ac)	Marginal Net Return ($/ac)‡
Check	225 A*	821.25
Aegis ESR	230 A	835.50
P-Value	0.4492	N/A

*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn, $4/acre Aegis ESR cost.

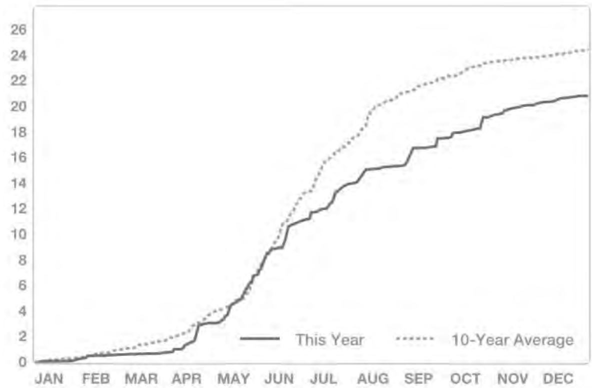
Summary: There was no significant yield difference between the Aegis® ESR treatment and the check.

This study was sponsored in part by: LTA Resource Management.

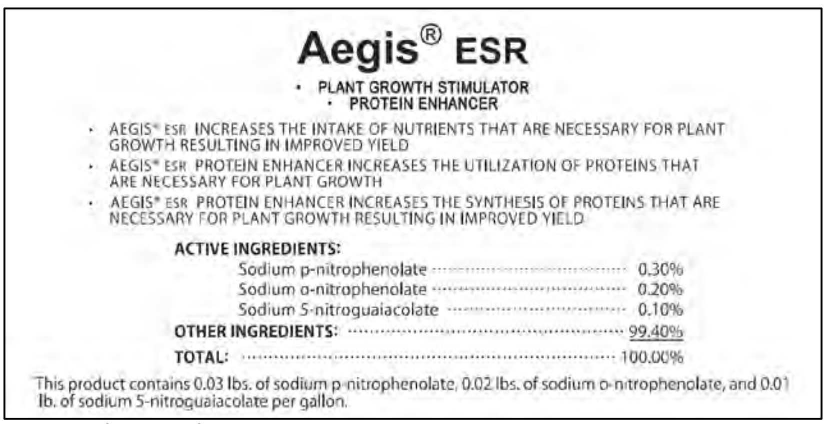
Aegis® ESR on Dryland Corn at VT

Study ID: 185135201501
County: Perkins
Soil Type: Valent loamy sand; Dailey loamy sand; Woodly fine sandy loam; Rosebud-Canyon loam;
Planting Date: 5/15/15
Harvest Date:
Population: 17,000
Row Spacing (in.) 30
Hybrid: Pioneer 35F50
Reps: 9
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** Glyphosate + Dicamba on 5/15/15
Post: BalanceFlex + Fulltime + Glyphosate (lable rates) on 6/23/15
Seed Treatment: Pioneer Poncho based seed treatment
Foliar Insecticides: none
Foliar Fungicides: none
Fertilizer: 100 lbs N + 30 lbs P + 12 lbs S + 0.5 lbs Micronutrients via planter and sprayer on 5/15/15

Irrigation: None
Rainfall (in.):



Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on dryland corn. Aegis® ESR was aerially applied at a rate of 5 oz/acre at the VT growth stage. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product active ingredients are below.



Aegis® ESR

- PLANT GROWTH STIMULATOR
- PROTEIN ENHANCER

- AEGIS® ESR INCREASES THE INTAKE OF NUTRIENTS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE UTILIZATION OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE SYNTHESIS OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD

ACTIVE INGREDIENTS:	
Sodium p-nitrophenolate	0.30%
Sodium o-nitrophenolate	0.20%
Sodium 5-nitroguaiacolate	0.10%
OTHER INGREDIENTS:	99.40%
TOTAL:	100.00%

This product contains 0.03 lbs. of sodium p-nitrophenolate, 0.02 lbs. of sodium o-nitrophenolate, and 0.01 lb. of sodium 5-nitroguaiacolate per gallon.

Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	82 A*	299.30
Aegis® ESR	79 A	274.85
P-Value	0.1049	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn, $4/acre Aegis® ESR cost, and $9.50/ac aerial application cost.

Summary: There was no significant yield difference between the Aegis® ESR treatment and the check. Marginal net return was lower for the Aegis® ESR treatment due to the increased cost of production which was not recovered.

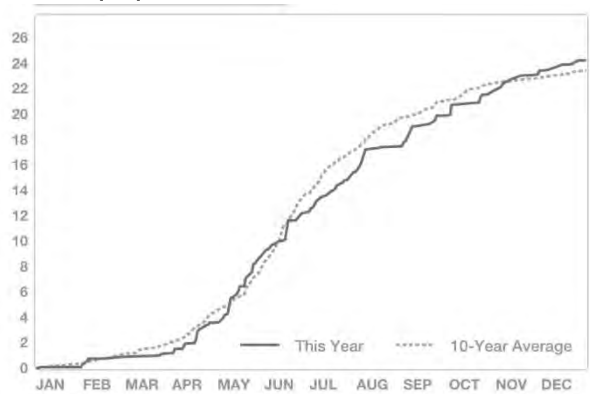
This study was sponsored in part by: LTA Resource Management.

Aegis® ESR on Dryland Corn at VT

Study ID: 184135201501
County: Perkins
Soil Type: Kuma silt loam;
Planting Date: 5/15/15
Harvest Date: 10/15/15
Population: 15,000
Row Spacing (in.) 30
Hybrid: Pioneer P0506
Reps: 7
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** 32 oz/ac of Durango (glyphosate) and 8 oz/ac dicamba (generic) on 6/1/15 ***Post:*** 32 oz/ac of Durango (glyphosate), 8 oz/ac Status, and 8 oz/ac Dual (generic) on 7/1/15
Seed Treatment: Poncho
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Fertilizer: 132 lbs/ac of 32-0-0, 132 lbs/ac of 28-0-0.5, and 132 lbs/ac of 9-27 on 5/15/15

Irrigation: None
Rainfall (in.):



Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on dryland corn. Aegis® ESR was aerially applied at a rate of 5 oz/acre at the VT growth stage. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product label with active ingredients is at right. Product active ingredients are below.

Aegis® ESR

- PLANT GROWTH STIMULATOR
- PROTEIN ENHANCER

- AEGIS® ESR INCREASES THE INTAKE OF NUTRIENTS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE UTILIZATION OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE SYNTHESIS OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD

ACTIVE INGREDIENTS:	
Sodium p-nitrophenolate	0.30%
Sodium o-nitrophenolate	0.20%
Sodium 5-nitroguaiacolate	0.10%
OTHER INGREDIENTS:	99.40%
TOTAL:	100.00%

This product contains 0.03 lbs. of sodium p-nitrophenolate, 0.02 lbs. of sodium o-nitrophenolate, and 0.01 lb. of sodium 5-nitroguaiacolate per gallon.

Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	131 A*	478.15
Aegis® ESR	131 A	464.65
P-Value	0.9405	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn, $4/acre Aegis® ESR cost, and $9.50/ac aerial application cost.

Summary: There was no significant yield difference between the Aegis® ESR treatment and the check. Marginal net return was lower for the Aegis® ESR treatment due to the increased cost of production which was not recovered.

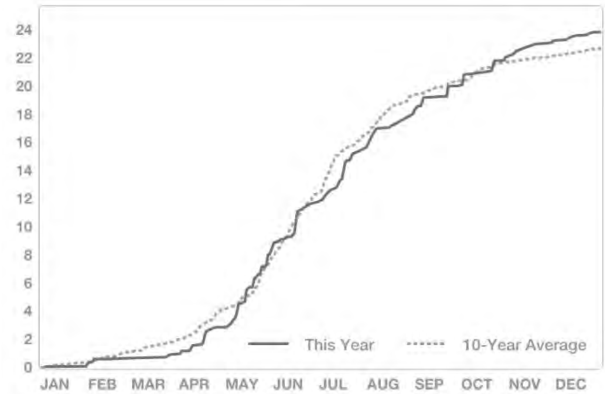
This study was sponsored in part by: LTA Resource Management.

Aegis® ESR on Irrigated Corn at VT

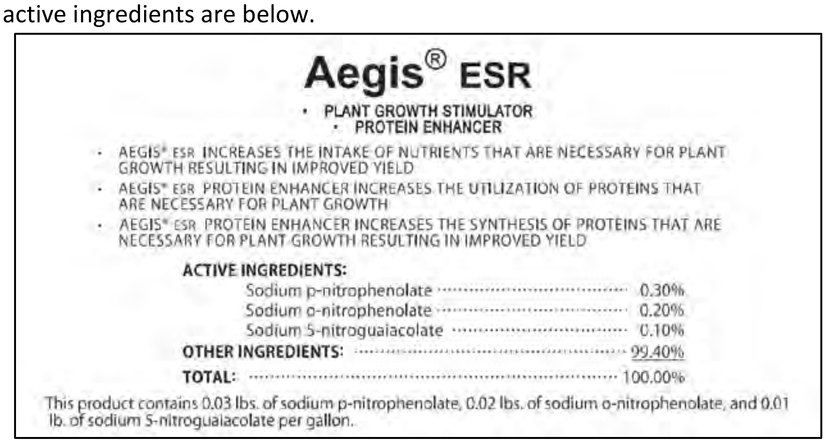
Study ID: 183135201501
County: Perkins
Soil Type: Valent loamy sand; Woodly loamy fine sand; Ascalon fine sandy loam;
Planting Date: 5/21/15
Harvest Date: 10/16/15
Population: 34,000
Row Spacing (in.) 30
Hybrid: DeKalb 5438
Reps: 7
Previous Crop: Unknown
Tillage: Strip-till
Herbicides: ***Pre:*** unknown ***Post:*** 30 oz/ac Buccaneer (glyphosate) and 2 oz/ac Status on 6/1/15;
30 oz/ac Buccaneer (glyphosate) and 15 oz/ac Dual (generic - Parallel) on 6/18/15.
Seed Treatment: none
Foliar Insecticides: None
Foliar Fungicides: 50 oz/ac Clorox on 8/7/15, 8/14/15 and 8/24/15

Fertilizer: 100 lb/ac 11-52-0, 100lb/ac 0-0-60, and 100 lb/ac 46-0-0 on 3/25/15;
5 gal/ac 6-21-6 on 5/21/15 (pop up w/ Seed);
40 gal/ac 28-0-5 sidedress on 6/18/15

Irrigation: Pivot, Total: 13"
Rainfall (in.):



Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on irrigated corn. Aegis® ESR was applied with an aerial application at a rate of 5 oz/acre at the VT growth stage. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product active ingredients are below.



Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Check	207 A*	31.2 A	755.55
Aegis® ESR	208 A	31.1 A	745.70
P-Value	0.742	0.6498	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn, $4/acre Aegis® ESR cost, and $9.50/ac aerial application cost.

Summary: There was no significant yield difference between the Aegis® ESR treatment and the check. Marginal net return was lower for the Aegis® ESR treatment due to the increased cost of production which was not recovered.

This study was sponsored in part by: LTA Resource Management.

Combined Analysis of Aegis® ESR Studies

Introduction: The purpose of this study was to determine if an application of Aegis® ESR plant growth stimulator would increase yield and profitability on corn. Aegis® ESR was applied at a rate of 5 oz/ac at the V5 and VT growth stage on both irrigated and dryland corn. Yields were harvested from treated and untreated strips and collected from yield monitor data. Product label with active ingredients is below.

Aegis® ESR

- PLANT GROWTH STIMULATOR
- PROTEIN ENHANCER

- AEGIS® ESR INCREASES THE INTAKE OF NUTRIENTS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE UTILIZATION OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH
- AEGIS® ESR PROTEIN ENHANCER INCREASES THE SYNTHESIS OF PROTEINS THAT ARE NECESSARY FOR PLANT GROWTH RESULTING IN IMPROVED YIELD

ACTIVE INGREDIENTS:

Sodium p-nitrophenolate	0.30%
Sodium o-nitrophenolate	0.20%
Sodium 5-nitroguaiacolate	0.10%
OTHER INGREDIENTS:	99.40%
TOTAL:	100.00%

This product contains 0.03 lbs. of sodium p-nitrophenolate, 0.02 lbs. of sodium o-nitrophenolate, and 0.01 lb. of sodium 5-nitroguaiacolate per gallon.

Product information from:
http://www.kellysolutions.com/ok/showproductinfo.asp?Product_Name=Aegis+ESR+Plant+Growth+Stimulator&EPA Id=64922-1-90441

Data were analyzed looking at both dryland and irrigated studies for both the V5 and VT applications. This data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was done with Fisher's LSD.

Table 1: Yield from Aegis® ESR applied at the V5 and VT growth stage on both dryland and irrigated sites.

	V5 Application (3 sites: 2 irrigated, 1 dryland) 21 total replications	**VT Application (3 sites: 2 dryland, 1 irrigated) 23 total replications**
	Yield (bu/ac)	**Yield (bu/ac)**
Treatment mean (treated-check)†	1.8 ns	-0.89 ns
Site (P>F)	<.0001	<.0001
Treatment (P>F)	0.2674	0.4242
Site*Treatment (P>F)	0.3945	0.2961

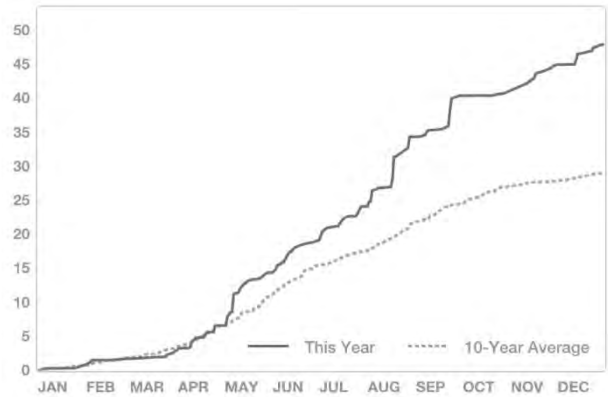
†Mean difference between control and treatment. Negative values indicate the control value is greater than the treated value.
Ns, indicates mean difference is not significant at alpha = 0.10

Summary: There was no significant yield increase with a V5 or VT application of Aegis® ESR.

Torque® on Corn

Study ID: 007155201501
County: Saunders
Soil Type: Yutan silty clay loam; Aksarben silty clay loam;
Planting Date: 5/22/15
Harvest Date: 11/1/15
Population: 28,000
Row Spacing (in.) 15
Hybrid: Channel 211-33VT2/Channel 213-26VT2
Reps: 8
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** Corvus, Atrazine, and Agrotain on 5/23/15 ***Post:*** Laudis, Roundup, and AMS
Seed Treatment: Acceleron 250
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Fertilizer: 120 lb/ac UAN 32% on 5/23/15
10 gal/ac 10-34-0 and 1pt/ac chelated zinc on 5/22/15
Irrigation: None
Rainfall (in.):



Introduction: The purpose of this study was to determine if the product Torque® improved corn yields. The product was applied at a rate of 1 pt/ac with starter fertilizer. Product ingredients at right. Two different hybrids were used in this study in a split-plot design (main-plot factor was Torque® vs no-Torque®, subplot factor was hybrid).

MINIMUM GUARANTEE

ACTIVE: 2 x 10^{-7}% lipo-chitooligosaccharide (LCO) formulated for corn applications

OTHER INGREDIENTS: Aqueous carrier > 99%

Product information from: *http://www.monsanto.com/products/pages/torque-us.aspx*

Results:

Effect	Yield Pr>F	Moisture Pr>F
Torque® Treatment	0.1486	0.0452
Hybrid	0.0005	0
Torque® Treatment * Hybrid	0.7408	0.2381

Because there was no interaction between Torque® treatment and the hybrid, the means of these are reported individually below.

Hybrid	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Channel 211-33VT2	212 B*	14.1 B	773.80
Channel 213-26VT2	217 A	15.1 A	792.05
P-Value	0.0005	0	N/A
Torque	**Yield (bu/ac)†**	**Moisture (%)**	**Marginal Net Return ($/ac)‡**
Check (10-34-0)	213 A	14.58 B	777.45
Torque (w/ 10-34-0)	215 A	14.64 A	775.73
P-Value	0.1486	0.0452	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn and $9.02/acre Torque® cost. There was no price difference between the two hybrids used.

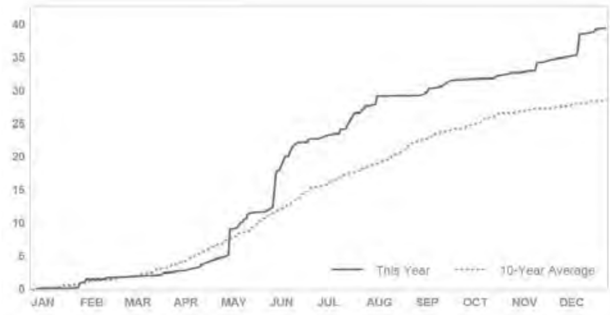
Summary: The Torque® treatment did not result in a significant yield increase. There was a yield difference between the two hybrids, with Channel 213-26VT2 having a higher yield. Grain moisture at havest was significantly higher for the Torque® treatment and for the hybrid Channel 213-26VT2.

QuickRoots™ on Corn

Study ID: 032035201503
County: Clay
Soil Type: Hastings silt loam; Hastings silty clay loam;
Planting Date: 4/28/15
Harvest Date: 11/1/15
Population: 36,000
Row Spacing (in.) 30
Hybrid: DK 65-66
Reps: 6
Previous Crop: Soybean
Tillage: Conventional Till
Herbicides: ***Pre:*** 13 oz./ac Verdict ***Post:*** Unknown
Seed Treatment: None
Insecticides: 6 oz/ac Capture LFR soil applied
Foliar Fungicides: 10 oz./ac Headline Amp

Fertilizer: 11-52-0 zone applied on 1/22/15;
100 lb. actual N/ac preplant;
120 lb. actual N/ac sidedress;
20 lb. actual N/ac foliar.

Irrigation: Pivot, Total: 4.5"
Rainfall (in.):



Introduction: QuickRoots™ wettable powder was mixed according to directions and applied to corn seed. Application rate was 7.2 grams per 80,000 kernals. Product active ingredients are shown at right. The check treatment was the grower's standard starter fertilizer - 3 gal 6-24-6 with 1 qt/acre micromax (2% Magnesium, 0.25% B, 2% Zn, 1.6% Fe, 0.5%Cu). The QuickRoots™ treatment also included the standard starter fertilizer plus the treated seed.

Extended Label

Microbial seed inoculant for improving nutrient availability for increased yield potential

Application Rate
7.2 g per 80,000 kernels (bag). Bucket treats 625 bags.

MINIMUM GUARANTEED ANALYSIS
ACTIVE: *Bacillus amyloliquefaciens TJ1000* ....3.1 x 10^8 cfu/g
Trichoderma virens GI-3........................7.4 x 10^7 cfu/g
INERT: wettable powder, 73.0%

QuickRoots™ is composed of live microorganisms which can quickly colonize and grow with the root as a plant develops.

Product information from:
http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CQUICKROOTS_WETTABLE_POWDER_FOR_CORN_0_0_0_3_16_2015_3_23_10_PM.pdf

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Starter (3 gal 6-24-6 + 1 qt Micromax)	241 A	14.1 A	879.65
Starter + 7.2g Quick Roots / 80,000 kernels	242 A*	14.2 A	875.66
P-Value	0.5161	0.2292	N/A

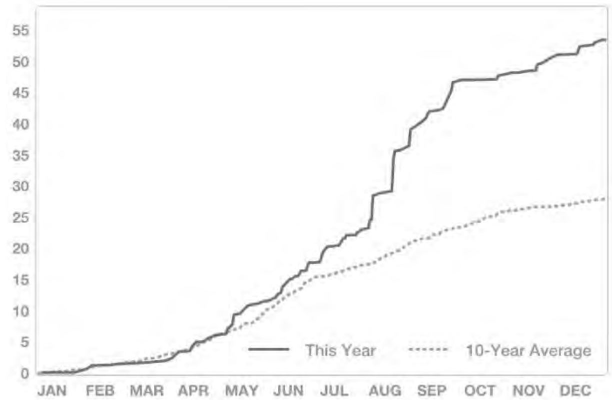
†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65/bu corn and $7.64/ac QuickRoots treatment.

Summary: The addition of QuickRoots™ did not result in an increase in yield or moisture differences.

SoilSet™ at Planting on Soybeans

Study ID: 218023201502
County: Butler
Soil Type: Holder silt loam; Hastings silty clay loam;
Planting Date: 5/30/15
Harvest Date: 10/19/15
Row Spacing (in.) 30
Hybrid: Asgrow AG3034 GenRR2Y
Reps: 7 (3 for yield, protein, oil, and weight)
Previous Crop: Corn
Seed Treatment: None

Irrigation: None
Rainfall (in.):



Introduction: There are a proliferation of products that claim to be beneficial for agricultural production. Some of these products mitigate stress, while other products enhance and increase plant growth and potentially increase crop yield. SoilSet™ is a product from Improcrop U.S.A. Inc., Nicholasville, KY. It contains 2% copper, 1.6% iron, 0.8% manganese, and 3.2% zinc. Product labeling notes that Soil-Set™ activates soil micro-flora favoring growth and plant root health and is a crop residue treatment designed to enhance degradation.

Local growers often graze cattle on corn stalks following corn grain harvest, thus reducing crop residue for the following planting season, which is often soybeans. Data on the efficacy of SoilSet™ for local crop production did not exist. This experiment was initiated to document and help provide replicated data for soybean growth response to SoilSet™ applied in the seed furrow at planting following grazed corn stalks from the previous year.

A field located north of David City that had produced corn in 2014, and had cattle grazing on stalks after harvest and prior to planting was selected for this experiment. SoilSet™ was applied at a rate of 10 oz./acre in-furrow through a fertilizing unit that also contained water. It was applied in-furrow at planting to six contiguous rows (½) of a twelve rows planter with 30 inch row spacings, thus resulting in seven replications of 12 row wide plots as the planter continued across the field. Plot length varied, ranging from almost 700 feet for four replicates, shortening to 254 feet for the shortest replicate.

Plant growth measurements were obtained throughout June and July. Plant populations were documented on June 16 by measuring four 20 foot sections of rows in each plot and counting the number of emerged soybeans. Plant heights (stems) and trifoliate leaf nodes on main-stems were measured on June 17 and 26, and July 9, 20 and 29. Ten plants per plot were measured on all sample dates except July 29, when only 6 plants per plot were used.

As some treatments in other experiment had resulting in increased branching at the cotyledon and unifoliate nodes, ten sets of five consecutive plants each were examined and branching recorded on July 20, however, only six sets were examined on recorded on July 29. Numbers of developing pods/plant were also documented on July 29 from six plants per plot.

Yield, % protein, % oil, and weight data were only collected for three replications.

Note: Plots were not randomized therefore conclusions should not be extrapolated beyond this field.

Results:

	Early Season Stand Count - June 16	Pods/plant - June 29
Check	113,007 A*	44 A
SoilSet 10oz/ac in Furrow	117,705 A	43 A
P-Value	0.2428	0.6608

	Height				
	June 17	June 26	July 9	July 20	July 29
Check	3.1 A	4.6 A	10.7 A	20.2 A	27.9 A
SoilSet 10oz/ac in Furrow	3.0 A	4.9 A	10.9 A	20.3 A	27.9 A
P-Value	0.6523	0.3136	0.4685	0.7749	0.9509

	Trifoliate Nodes				
	June 17	June 26	July 9	July 20	July 29
Check	1 A	3 A	6 A	10 A	12 A
SoilSet 10oz/ac in Furrow	1 A	3 A	6 A	10 A	12 A
P-Value	0.1501	0.6504	0.1528	0.8314	0.122

	Unifoliate Node Branches (%)		Cotyledon Node Branches (%)	
	July 20	July 29	July 20	July 29
Check	15.3 A	16.4 A	3.0 A	3.3 A
SoilSet 10oz/ac in Furrow	18.9 A	16.0 A	2.7 A	2.4 A
P-Value	0.2809	0.927	0.7358	0.6685

	Yield (bu/ac)†	Oil (%)	Protein (%)	Weight (grams/100 seeds)	Marginal Net Return ($/ac)‡
Check	72 A	17.7 A	41.5 A	19 A	640.80
SoilSet 10oz/ac in Furrow	72 A	18.0 A	41.0 A	19 A	632.80
P-Value	0.7601	0.726	0.5967	0.5972	N/A

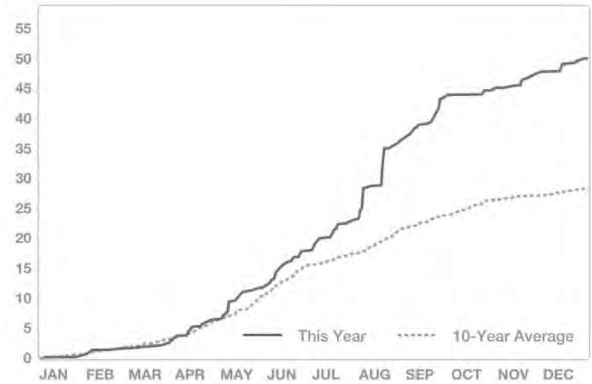
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $8/acre SoilSet cost.

Summary: No significant differences were seen in any of the plant characteristics measured. Additionally, the use of soil set did not result in yield, protein, oil, or seed weight differences. Use of the SoilSet™ treatment did not provide a positive return on investment.

RyzUp SmartGrass® applied with Herbicides to Soybeans at V4

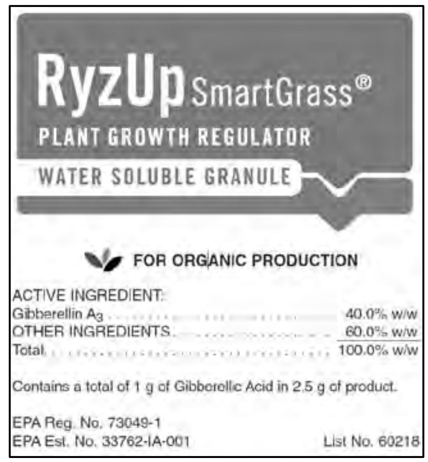
Study ID: 198023201501
County: Butler
Soil Type: Butler silt loam; Olbut-Butler silt loam;
Planting Date: Unknown
Harvest Date: 10/10/15
Population: Unknown
Row Spacing (in.) 30
Hybrid: Seitec 8261RR
Reps: 5
Previous Crop: Corn
Tillage: Unknown
Seed Treatment: Unknown

Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: This study was looking at RyzUp SmartGrass® applied with a herbicide and fungicide application. Treatments were herbicide and fungicide only (check), herbicide and fungicide with 0.3 oz/ac RyzUp SmartGrass®, and herbicide and fungicide with 0.5 oz/ac RyzUp SmartGrass®. Herbicides used in the study were 24 oz/ac Durango and 0.5 oz/ac Cadet. The fungicide was 2.5 oz/ac Affiance. AMS was applied with all treatments at a rate of 17 lbs/100 gal. Application was on July 8 at 13 gpa using air induction T (Brown) 11005 spray tips. Plants were at V4.5 and were just starting to flower (<2% with flowers).

RyzUp SmartGrass® active ingredients are at right. RyzUp SmartGrass® is not currently labeled for use in soybeans, however there is a tolerance for the active ingredient.



Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

Results:

	Height (in.)		Trifoliate Nodes		Pods/ plant	Cotyledon Node Branches (%)	Unifoliate Node Branches (%)
	July 20	**July 29**	**July 20**	**July 29**	**July 29**	**July 29**	**July 29**
Check	15.2 B	20.6 B	8 A	11 A	25 AB	0.7 A	22.7 A
RyzUp SmartGrass (0.3 oz)	17.5 A	23.6 A	8 A	11 A	23 B	1.0 A	19.3 A
RyzUp SmartGrass (0.5 oz)	18.0 A	24.3 A	8 A	11 A	29 A	1.0 A	15.0 A
P-Value	0.0077	0.0033	0.6081	0.1457	0.0901	0.8905	0.4197

	% Defoliation of Trifoliate Node								
	1st	2nd	3rd	4th	5th	2-3	3-4	2-4	1-4
Check	73 A	42 A	44 A	51 A	6 A	20 A	48 A	46 A	53 A
RyzUp SmartGrass (0.3 oz)	61 A	31 A	31 AB	28 A	9 A	43 A	29 B	30 B	38 B
RyzUp SmartGrass (0.5 oz)	69 A	34 A	18 B	31 A	26 A	31 A	24 B	28 B	38 B
P-Value	0.75	0.74	0.04	0.12	0.42	0.11	0.01	0.02	0.04

	Yield (bu/ac)†	Moisture (%)	Test Weight	Oil (%)	Protein (%)	Weight (grams/ 100 seeds)	Marginal Net Return ($/ac)‡
Check	70 A*	11.6 A	58 A	19.6 B	38.6 A	16 A	623.00
RyzUp SmartGrass (0.3 oz)	70 A	11.5 A	58 A	20.4 A	38.0 A	16 A	616.00
RyzUp SmartGrass (0.5 oz)	69 A	11.5 A	58 A	20.0 AB	38.4 A	16 A	602.43
P-Value	0.3774	0.834	0.8392	0.0232	0.3222	0.4381	N/A

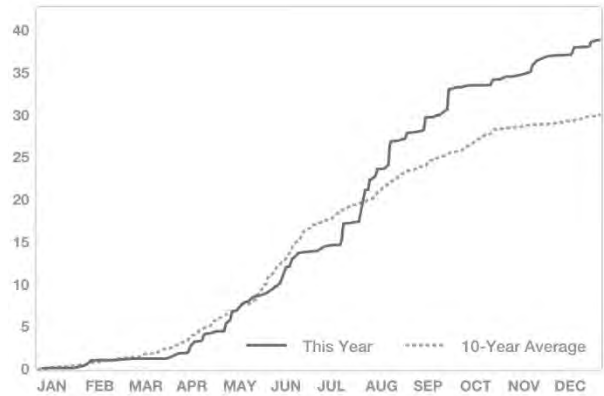
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $23.33/oz RyzUp cost.

Summary: Defoliation data was taken on July 29. The herbicide and fungicide only treatment (check) had higher defoliation than the 0.5 oz/ac RyzUp SmartGrass® treatment at the 3rd trifoliate node. The check also had higher defoliation than both rates of RyzUp SmartGrass® at trifoliate node 3-4, 2-4, and 1-4. On July 20 and 29 the check was shorter. On July 29, pods/plant were also counted; neither the 0.5 oz/ac rate or 0.3 oz/ac rate of RyzUp SmartGrass® had more pods than the check. No difference was seen in yield, moisture, or test weight between the three treatments. Use of RyzUp SmartGrass® did not provide a return on investment.

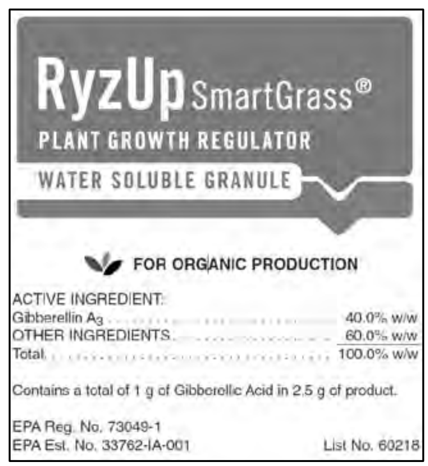
RyzUp SmartGrass® applied with Herbicides to Soybeans at Unifoliate Growth Stage

Study ID: 220125201501
County: Nance
Soil Type: Belfore silty clay loam; Fillmore silt loam;
Planting Date: 5/18/15
Harvest Date: 10/13/15
Population: 156,000
Row Spacing (in.)
Hybrid: Syngenta 24K2
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Seed Treatment: CruiserMax - Vibrance
Fertilizer: Preplant CVA Mez product broadcast; 3 gal/ac CVA starter in-furrow at planting

Note: Field variation was noted, as higher areas of field were much ahead of rest of field, and yields varied widely. Low areas had standing water from time to time from the very moist spring/summer experienced.
Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Introduction: This study is looking at the impact of adding RyzUp SmartGrass® to a post herbicide application. The check treatment was 44 oz/ac Glyphosate 41 Plus and ClassAct NG. RyzUp SmartGrass® was evaluated by adding it to these two products. RyzUp SmartGrass® active ingredients are shown at right. All products were applied on June 8 at 15 gpa at the unifoliate growth stage. RyzUp SmartGrass® is not currently labeled for use in soybeans, however there is a tolerance for the active ingredient.



Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

Results:

	Height (in.)					
	June 15	**June 24**	**June 30**	**July 9**	**July 17**	**July 27**
Check	8.7 B*	5.6 B	6.7 B	11.6 A	15.2 A	25.8 A
RyzUp SmartGrass (0.3 oz)	12.2 A	6.4 A	7.8 A	12.1 A	15.7 A	25.5 A
P-Value	0.0022	0.0993	0.0783	0.4969	0.6104	0.8312

	Trifoliate Nodes					
	June 15	**June 24**	**June 30**	**July 9**	**July 17**	**July 27**
Check	2 A	3 A	5 A	7 A	9 A	12 A
RyzUp SmartGrass (0.3 oz)	2 A	4 A	5 A	7 A	9 A	13 A
P-Value	0.7237	0.5137	0.4863	0.9236	0.5985	0.9206

	Cotyledon Node Branches (%)			Unifoliate Node Branches (%)		
	July 9	July 17	July 27	July 9	July 17	July 27
Check	9.5 A	1.8 A	2.1 A	22.5 B	26.8 B	18.8 B
RyzUp SmartGrass (0.3 oz)	9.0 A	4.0 A	3.3 A	41.5 A	49.3 A	52.1 A
P-Value	0.824	0.3093	0.6376	0.0202	0.0274	0.0065

	Pods/plant July 27	Yield (bu/ac)†	Protein (%)	Oil (%)	Weight (grams/ 100 seeds)	Marginal Net Return ($/ac)‡
Check	38 B	63 A	37.5 A	18.9 A	16.4 A	560.70
RyzUp SmartGrass (0.3 oz)	42 A	64 A	37.6 A	18.9 A	16.0 B	562.60
P-Value	0.0364	0.9517	0.8601	0.8311	0.0256	N/A

†Bushels per acre corrected to 13% moisture.

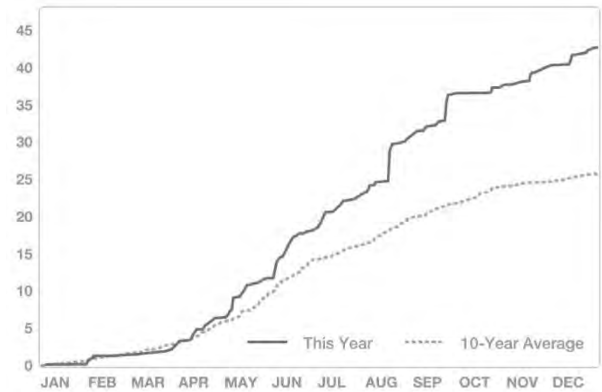
*Values with the same letter are not significantly different at a 90% confidence level.

‡Net Return based on $8.90/bu soybeans and $7/acre RyzUp cost. No application cost is added as this is expected to be applied with a post application of herbicide.

Summary: The RyzUp SmartGrass® treatment had significantly taller plants on June 15, 24, and 30. The RyzUp SmartGrass® treatment also had significantly more branching at the unifoliate nodes on July 9, 17, and 27. On July 27, there were significantly more pods/plant for the RyzUp SmartGrass® treatment. At harvest, there was no difference in yield, % protein, or % oil between the two treatments. The RyzUp SmartGrass® treatment had a lower seed weight than the untreated check. Due to the lack of yield benefit, the cost of application was not recovered.

RyzUp SmartGrass® applied with Herbicides to Soybeans at V2

Study ID: 069023201502
County: Butler
Soil Type: Hastings silt loam; Fillmore silt loam;
Planting Date: 6/1/15
Harvest Date: 10/12/15
Population: Unknown
Row Spacing (in.) 30
Hybrid: NK S27-J7
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** None ***Post:*** 40 oz/ac RoundUp PowerMax, 17 lb AMS/100 gal H2Os/100, and 0.4 oz/ac Cadet on 7/30/15
Seed Treatment: Unknown
Foliar Insecticides: None
Foliar Fungicides: None
Fertilizer: None
Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Introduction: This study was looking at RyzUp SmartGrass® applied with a herbicide application. The herbicide application was 40 oz/ac RoundUp PowerMax, 17 lb AMS/100 gal H2Os/100 and 0.4 oz/ac Cadet on 7/30/15. Treatments were herbicide only, herbicide with 0.3 oz/ac RyzUp SmartGrass®, and herbicide with 0.5 oz/ac RyzUp SmartGrass®. The growth stage at application was V2. RyzUp SmartGrass® product ingredients are at right. There was 10 gpa in the final deposition and the air induction nozzle resulted in spotting of application rather than a uniform distribution. RyzUp SmartGrass® is not currently labeled for use in soybeans, however there is a tolerance for the active ingredient.

Product information from: *http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm*

Results:

	Height (in.)			
	July 7	**July 13**	**July 22**	**July 31**
Check	7.7 B*	10.5 B	16.4 B	23.3 B
RyzUp SmartGrass (0.3 oz)	9.6 A	12.6 A	20.3 A	28.7 A
RyzUp SmartGrass (0.5 oz)	10.5 A	12.9 A	20.0 A	29.5 A
P-Value	*0.0067*	*<0.0001*	*0.0188*	*0.0044*
	Trifoliate Nodes			
	July 7	**July 13**	**July 22**	**July 31**
Check	5 A	6 A	9 A	10 A
RyzUp SmartGrass (0.3 oz)	5 A	6 A	9 A	10 A
RyzUp SmartGrass (0.5 oz)	5 A	6 A	9 A	10 A
P-Value	*0.7385*	*0.8357*	*0.8138*	*0.9128*

	Unifoliate Branches (%) July 31	Defoliation of 1st Trifoliate (%) July 31	Defoliation of 2nd Trifoliate (%) July 31	Defoliation of 3rd Trifoliate (%) July 31
Check	5.8 A	100 A	92 A	40 A
RyzUp SmartGrass (0.3 oz)	3.3 A	100 A	96 A	56 A
RyzUp SmartGrass (0.5 oz)	4.6 A	97 A	90 A	43 A
P-Value	*0.7622*	*0.4219*	*0.8671*	*0.5244*

	Yield (bu/ac)†	Oil (%)	Protein (%)	Weight (grams/100 seeds)	Marginal Net Return ($/ac)‡
Check	63 A	18.8 A	39.5 B	17 A	560.70
RyzUp SmartGrass (0.3 oz)	67 A	18.6 A	40.1 AB	18 A	589.30
RyzUp SmartGrass (0.5 oz)	68 A	18.6 A	40.4 A	18 A	593.53
P-Value	0.6738	0.9282	0.0425	0.7368	N/A

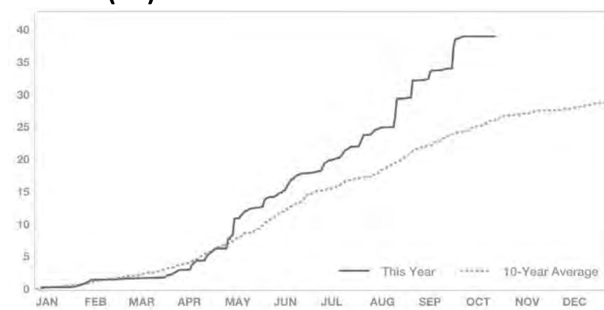
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $23.34/oz RyzUp SmartGrass cost.

Summary: At all four dates that height was measured, the RyzUp SmartGrass® treatments had taller plants than the herbicide only check. There were no differences in trifoliate nodes at any of the measurement dates nor in % defoliation for the three treatments No difference was seen in yield, % oil, or seed weight between the three treatments. The RyzUp SmartGrass® 0.5 oz/ac treatment had higher % protein at harvest than the herbicide only check.

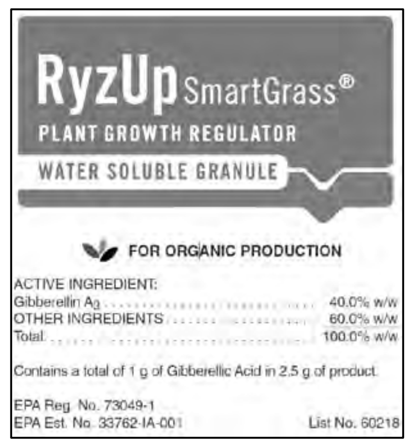
RyzUp SmartGrass® on Corn

Study ID: 039155201501
County: Saunders
Soil Type: Tomek silt loam; Filbert silt loam; Fillmore silt loam; Yutan silty clay loam
Planting Date: 4/29/15
Harvest Date: 10/28/15
Population: 32,000
Row Spacing (in.) 30
Hybrid: GH 12L09 3010 A
Reps: 9
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 12 oz/ac Verdict, 32 oz/ac Atrazine 4L, and 22 oz/ac Roundup PowerMax on 4/29/15
Post: 57.6 oz/ac Halex GT and 16 oz/ac Atrazine 4L on 6/8/15
Seed Treatment: A500

Foliar Insecticides: 1.92 oz/ac Baythroid on 6/8/15; 3.2 oz/ac Fastac on 6/25/15; 6.4 oz/ac Brigade on 7/29/15
Foliar Fungicides: 4 oz/ac Priaxor on 6/25/15; 10 oz/ac Headline Amp on 7/29/15
Fertilizer: 9 gal/ac 10-34-0 and 2.5 qts/ac 10% zinc on 4/29/15 (Totaled 36 lb P + 10.5 lb N); 165 lbs/ac NH_3 on 5/30/15
Irrigation: None
Rainfall (in.):



Introduction: The purpose of this study was to determine the effect of RyzUp SmartGrass® growth promoter on corn yield. The product was applied with herbicide and Quest (water conditioner and spray adjuvant) on 6/8/15 when corn was at V5. Stalk lodging was assessed using the "push" method on 10/6/15.



Product information from: *http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm*

Results:

	Yield†	Moisture (%)	Lodging (%)	Net Return‡
Check	247 A*	14.3 A	13 A	$901.55
RyzUp SmartGrass (0.5 oz)	234 A	14.1 B	15 A	$844.10
P-Value	0.2502	0.044	0.456	--

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn and $10.00 treatment cost.

Summary: There was no significant difference in corn yield or stalk strength between RyzUp SmartGrass® growth promoter and the untreated check. The untreated check had significantly higher harvest moisture than the RyzUp SmartGrass® growth promoter treatment.

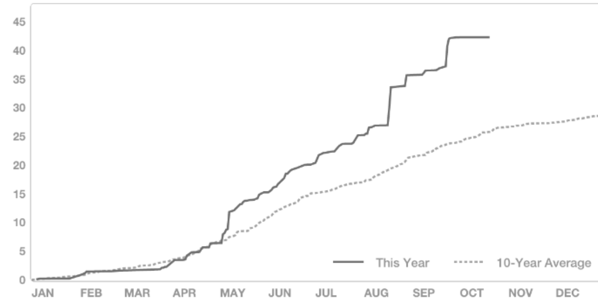
This study was sponsored in part by: Valent U.S.A. Corporation.

RyzUp SmartGrass® on Corn

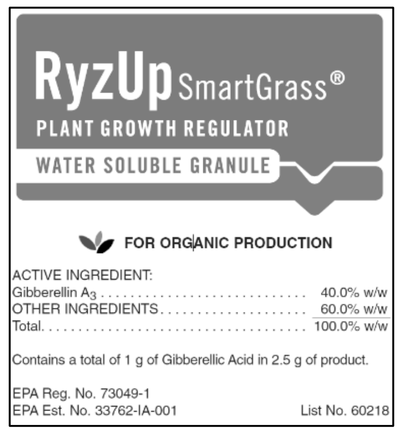
Study ID: 180155201501
County: Saunders
Soil Type: Tomek silt loam; Yutan silty clay loam;
Planting Date: 4/22/15
Harvest Date: 10/20/15
Population: 36,000
Row Spacing (in.) 30
Hybrid: Pioneer P1266AM
Reps: 7
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 4 oz/ac Corvus and 1 pt/ac 2-4,D burndown ***Post:*** 30 oz/ac Durango 30, 2 oz/ac Laudis, and 8 oz/ac Atrazine
Seed Treatment: Poncho 1250
Foliar Insecticides: None

Foliar Fungicides: 10 oz Headline Amp - Post Tassel
Fertilizer: 180 lbs/ac NH3 Fall 2014
Starter - 36 lbs/ac N, 32 lbs/ac P, 12 lbs/ac S

Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: The purpose of this study was to determine the effect of RyzUp SmartGrass® growth promoter on corn yield. The product was applied with herbicide and 1 qt of NIS per 100 gal of water on 6/1/15 when corn was at V4. Stalk lodging was assessed using the "push" method on 10/6/15.

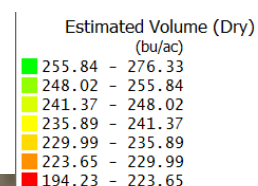


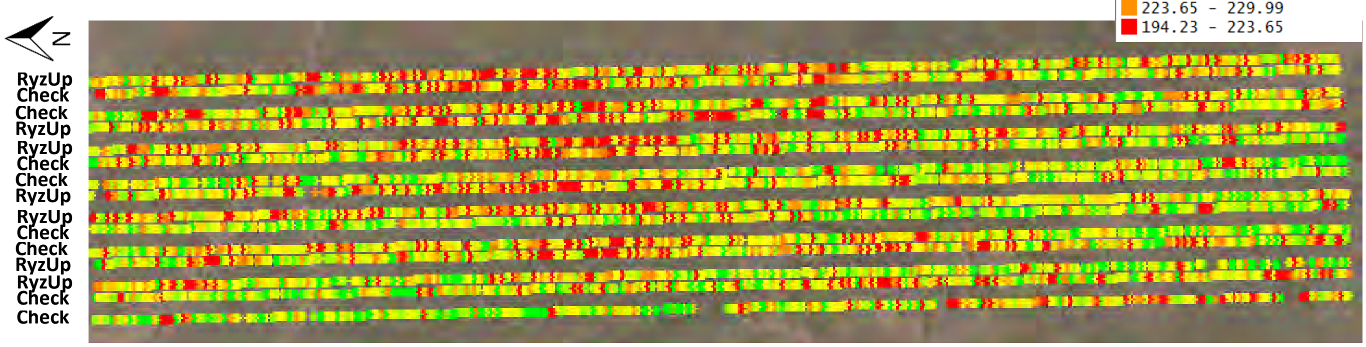
Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

Results:

	Yield†	Moisture (%)	Lodging (%)	Net Return‡
Check	240 A*	14.3 A	33 A	876.00
RyzUp SmartGrass (0.5 oz)	237 A	14.3 A	24 B	855.05
P-Value	0.1435	0.9136	0.0228	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65/bu corn price and $10/ac product treatment cost.





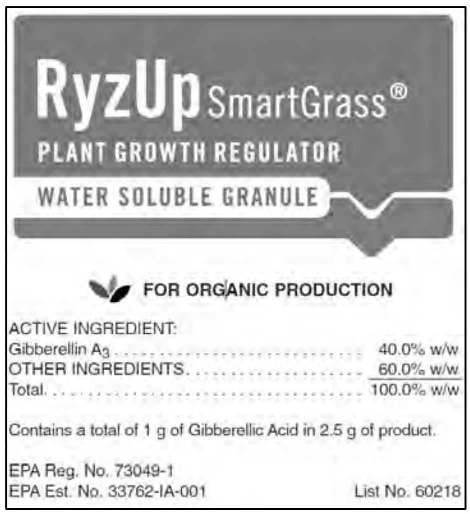
Summary: There was no significant difference in yield or moisture between the RyzUp SmartGrass® treatment and the check. The RyzUp SmartGrass® treatment had lower stalk lodging.

This study was sponsored in part by: Valent U.S.A. Corporation.

Combined Analysis of RyzUp SmartGrass® on Corn

Introduction: In 2015, there were two studies which looked at the use of RyzUp SmartGrass® (product information below) on corn. These studies were located in Saunders County. Both were no-till sites, on irrigated, one rainfed. The product was applied at V4-V5 with a herbicide application. At one site, 1 qt of NIS per 100 gal of water was used; at the other site, Quest water conditioner and spray adjuvant was used. Stalk lodging was assessed at both sites in early October.

The objective was to determine the effect of RyzUp SmartGrass® application on corn yield, stalk strength, and moisture. Data analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was done with Fisher's LSD.



Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

	Yield **Bu/ac**	**Moisture** **%**	**Stalk Lodging** **%**
Treatment mean (treated-check)†	-7.7$_{ns}$	-0.04$_{ns}$	-3.17$_{ns}$
Site (P>F)	0.6841	0.8372	0.0010
Treatment (P>F)	0.2237	0.2331	0.1411
Site*Treatment (P>F)	0.3909	0.1768	0.0190

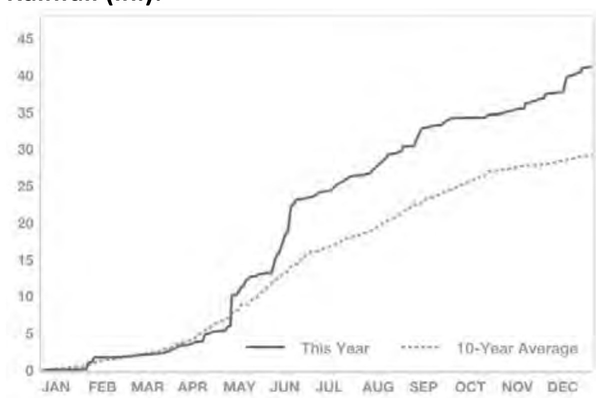
†Mean difference between control and treatment. Negative values indicate the control value is greater than the treated value.
Ns, indicates mean difference is not significant at alpha = 0.10

Summary: Looking across all 3 sites, there was no significant yield, moisture, or stalk lodging differences between the check and RyzUp SmartGrass® application.

Surfactants and RyzUp SmartGrass® on Big Bluestem

Study ID: 222109201501
County: Lancaster
Soil Type: Aksarben silty clay loam;
Reps: 4
Fertilizer: 100 lbs/acre of actual N applied broadcast prior to study initiation as 34-0-0, this was due to low N on soil test.

Irrigation: None
Rainfall (in.):



Soil Sample:

								Ammonium Acetate ---------ppm--------					DTPA ---------ppm---------						% Base Saturation				
Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/ cm	Excess Lime Rating	OM LOI- %	FIA Nitrate ppm N	0-8" Nitrate Lbs N/A	M-P3 ppm P	K	Ca	Mg	Na	Ca-P Sulfate ppm S	Zn	Fe	Mn	Cu	Hot Water Boron ppm B	Sum of Cation me/ 100g	H	K	Ca	Mg	Na
6.4	6.8	0.21	NONE	4.1	0.8	2	4	377	3145	779	13	9	0.55	37.6	11.2	1.41	0.75	25.0	7	4	63	26	0

Introduction: The objective of this study was to evaluate the effect of RyzUp SmartGrass® applied in combinations with various surfactants on plant growth and forage production. RyzUp SmartGrass® was applied at a rate of 0.3 oz/ac and 0.9 oz/ac in combination with surfactants. Treatment combinations are listed in the results table below. RyzUp SmartGrass® active ingredients are shown at right. This is a small plot study conducted on-farm.

Product information from: *http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm*

Results:

	Forage Height (in.)							
	May 21	**May 28**	**June 3**	**June 10**	**June 17**	**June 26**	**July2**	**July 8**
Check	7.3 A	9.6 A	12.4 A	17.1 B	22.2 B	27.6 A	28.8 A	31.5 A
RyzUp SmartGrass 0.3 oz/ac + ClassAct NG 2.5%	7.2 A	10.5 A	12.5 A	17.6 AB	23.5 AB	28.0 A	29.9 A	33.5 A
RyzUp SmartGrass 0.9 oz/ac + ClassAct NG 2.5%	7.8 A*	10.5 A	13.5 A	18.8 A	24.7 A	27.9 A	29.4 A	32.0 A
RyzUp SmartGrass 0.3 oz. + BioLink Surfactant and Penetrant	7.8 A	9.6 A	13.0 A	17.4 B	23.7 AB	28.7 A	29.3 A	34.0 A
RyzUp SmartGrass 0.3 oz. + BioLink Spreader Sticker	7.5 A	9.9 A	12.9 A	18.1 AB	24.4 AB	28.8 A	29.5 A	32.2 A
P-Value	*0.2321*	*0.1444*	*0.2201*	*0.0388*	*0.1142*	*0.672*	*0.8871*	*0.2412*

	Extended Leaf Height (in.)							
	May 21	May 28	June 3	June 10	June 17	June 26	July 2	July 8
Check	10.8 AB	13.2 A	17.0 A	22.8 A	28.9 A	36.5 A	39.5 A	42.1 A
RyzUp SmartGrass 0.3 oz/ac + ClassAct NG 2.5%	10.1 B	14.1 A	17.7 A	23.7 A	30.6 A	36.6 A	38.9 A	45.7 A
RyzUp SmartGrass 0.9 oz/ac + ClassAct NG 2.5%	11.3 A	13.6 A	19.1 A	24.8 A	31.4 A	37.0 A	37.2 A	44.5 A
RyzUp SmartGrass 0.3 oz. + BioLink Surfactant and Penetrant	11.3 A	12.7 A	18.1 A	23.6 A	29.9 A	37.0 A	39.4 A	46.1 A
RyzUp SmartGrass 0.3 oz. + BioLink Spreader Sticker	11.0 AB	13.7 A	17.4 A	24.2 A	31.6 A	36.9 A	40.2 A	44.8 A
P-Value	*0.0353*	*0.338*	*0.1924*	*0.2551*	*0.134*	*0.9413*	*0.7853*	*0.3654*

	Lbs Hay/Acre – July 15	Product and Application Cost‡
Check	2,329 AB	$0.00
RyzUp SmartGrass 0.3 oz/ac + ClassAct NG 2.5%	2,440 AB	$24.22
RyzUp SmartGrass 0.9 oz/ac + ClassAct NG 2.5%	2,385 AB	$38.22
RyzUp SmartGrass 0.3 oz. + BioLink Surfactant and Penetrant	2,240 B	$17.75
RyzUp SmartGrass 0.3 oz. + BioLink Spreader Sticker	3,045 A	$20.72
P-Value	*0.0819*	*N/A*

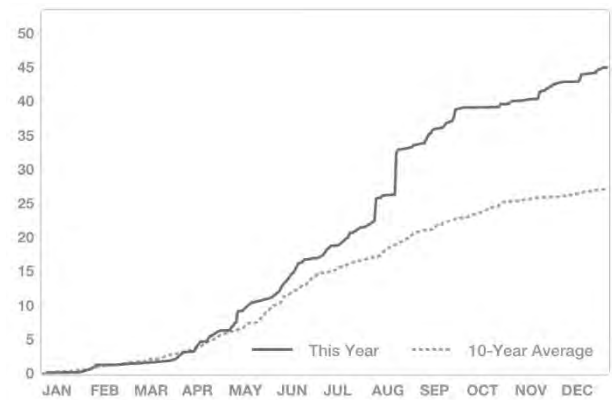
*Values with the same letter are not significantly different at a 90% confidence level.
‡Product and Application Cost calculated assuming $8.12/ac ground application cost and $23.33/oz RyzUp cost. Surfactant costs vary.

Summary: On May 21, there were differences between products tested in the extended leaf height, however none of the product combinations resulted in heights that were significantly greater than the check. On June 10 and 17, the 0.9 oz/ac rate of RyzUp SmartGrass® in combination with ClassAct 2.5% NG was significantly taller than the check. Hay yield was determined on July 15; while treatment differences did exist, none of the product combinations tested resulted in yields that were higher than the check.

Surfactants and RyzUp SmartGrass® on Smooth Brome

Study ID: 217023201501
County: Butler
Soil Type: Hastings silt loam; Hastings silty clay loam
Harvest Date: 5/18/15 & 7/14/15
Reps: 4

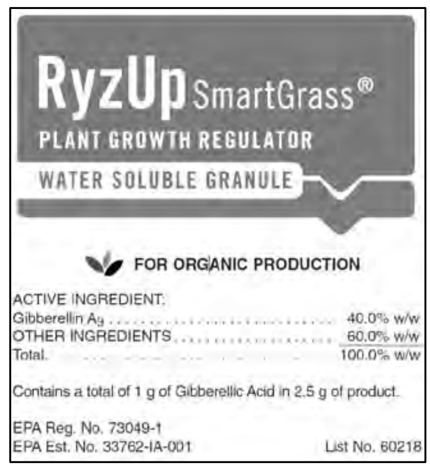
Rainfall (in.):



Soil Sample:

								Ammonium Acetate ----ppm----					DTPA ----ppm----						% Base Saturation				
Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	OM LOI-%	FIA Nitrate ppm N	0-8" Nitrate Lbs N/A	M-P3 ppm P	K	Ca	Mg	Na	Ca-P Sulfate ppm S	Zn	Fe	Mn	Cu	Hot Water Boron ppm B	Sum of Cations me/100g	H	K	Ca	Mg	Na
5.8	6.4	0.17	NONE	5.0	0.7	2	10	325	2094	306	10	8	1.21	69.5	13.6	0.86	0.54	20.2	31	4	52	13	0

Introduction: The objective of this study was to evaluate the effect of RyzUp SmartGrass® applied in combinations with various surfactants on plant growth and forage production. RyzUp SmartGrass® was applied at a rate of 0.3 oz/ac on April 18 at 28 gpa with flat fan nozzles. Treatment combinations are listed in the results table below. RyzUp SmartGrass® active ingredients are shown at right. This is a small plot study conducted on-farm. Field had low P and N fertility (see soil sample data above).



Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

Results:

	Extended Leaf Height (in.)				
	Apr. 27	**May 7**	**May 18**	**May 26**	**June 1**
Check	8.4 CD*	10.5 CDE	13.4 DE	14.3 AB	15.5 AB
Generate - 16 oz/ac	7.7 D	9.1 E	12.5 E	12.6 B	14.3 B
BioLink Spreader-Sticker 8 oz/100 gal	8.4 CD	9.8 DE	12.5 E	13.1 B	15.6 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	9.5 BC	11.6 BCD	15.1 ABCD	14.3 AB	16.4 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	9.4 BC	12.5 BC	14.9 ABCD	14.6 AB	16.2 AB
RyzUp 0.3 oz + ClassAct 1.25% NG	10.6 AB	15.0 A	16.4 AB	16.6 A	17.8 AB
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	10.2 AB	13.0 AB	15.8 ABC	15.6 AB	16.6 AB
RyzUp 0.3 oz + ClassAct 2.5% NG	11.3 A	14.8 A	16.9 A	16.9 A	18.3 A
RyzUp 0.3 oz + Chaperone 10 oz/ac	9.4 BC	11.7 BCD	14.1 CDE	13.0 B	15.5 AB
RyzUp 0.3 oz + FastTrack 0.5%	10.3 AB	12.7 B	14.4 BCDE	14.5 AB	16.1 AB
RyzUp 0.3 oz + UltraSurf AMS 2.5%	10.1 AB	13.5 AB	14.8 ABCD	14.5 AB	14.7 AB
RyzUp 0.3 oz + WetSit 0.25%	9.6 BC	12.2 BC	13.8 CDE	13.7 AB	15.9 AB
P-Value	*<0.0001*	*<0.0001*	*<0.0001*	*0.0041*	*0.0765*

	Natural Height (in.)		
	May 18	May 26	June 1
Check	12.6 BCD	13.4 AB	15.1 AB
Generate - 16 oz/ac	11.2 D	11.9 B	13.6 B
BioLink Spreader-Sticker 8 oz/100 gal	11.6 CD	12.2 B	15.0 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	12.7 BCD	13.6 AB	15.9 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	13.3 ABCD	13.8 AB	15.7 AB
RyzUp 0.3 oz + ClassAct 1.25% NG	15.1 AB	15.7 A	16.9 AB
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	14.0 ABC	14.8 AB	16.1 AB
RyzUp 0.3 oz + ClassAct 2.5% NG	15.4 A	15.5 A	17.8 A
RyzUp 0.3 oz + Chaperone 10 oz/ac	12.6 BCD	12.0 B	14.9 AB
RyzUp 0.3 oz + FastTrack 0.5%	13.9 ABC	13.5 AB	15.6 AB
RyzUp 0.3 oz + UltraSurf AMS 2.5%	13.6 ABCD	13.6 AB	14.1 AB
RyzUp 0.3 oz + WetSit 0.25%	12.9 ABCD	13.0 AB	15.4 AB
P-Value	*0.0003*	*0.0027*	*0.0687*

	Lbs Hay/Acre		
	May 18	July 14	Product and Application Cost‡
Check	1,534 AB	3,254 A	$0.00
Generate - 16 oz/ac	1,113 B	2,707 A	$17.87
BioLink Spreader-Sticker 8 oz/100 gal	1,293 AB	2,785 A	$9.88
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	1,494 AB	2,988 A	$16.88
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	1,755 AB	3,220 A	$21.43
RyzUp 0.3 oz + ClassAct 1.25% NG	1,958 A	3,455 A	$19.67
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	1,662 AB	3,301 A	$29.42
RyzUp 0.3 oz + ClassAct 2.5% NG	1,989 A	3,595 A	$24.22
RyzUp 0.3 oz + Chaperone 10 oz/ac	1,515 AB	2,880 A	$25.12
RyzUp 0.3 oz + FastTrack 0.5%	1,595 AB	3,210 A	Unknown
RyzUp 0.3 oz + UltraSurf AMS 2.5%	1,435 AB	2,776 A	$22.12
RyzUp 0.3 oz + WetSit 0.25%	1,502 AB	2,919 A	Unknown
P-Value	0.047	0.6738	N/A

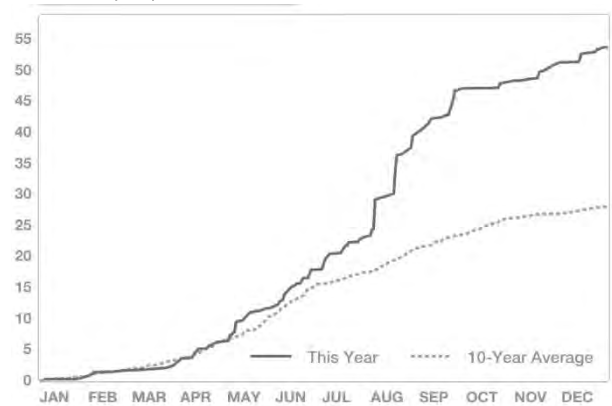
*Values with the same letter are not significantly different at a 90% confidence level.
‡Product and Application Cost calculated assuming $8.12/ac ground application cost and $7.00/ac RyzUp 0.3 oz. cost. Surfactant costs vary.

Summary: At the first harvest date on May 18, none of the surfactants applied with RyzUp SmartGrass® or alone resulted in a higher yield than the untreated check. The second harvest date on July 14 resulted in no statistical yield difference between any of the treatment combinations examined.

Surfactants and RyzUp SmartGrass® on Smooth Brome

Study ID: 218023201501
County: Butler
Soil Type: Hastings silty clay loam; Ponca-Crofton
Choose Soil Texture;
Harvest Date: 5/1/15 & 6/24/15
Reps: 4

Rainfall (in.):



Soil Sample:

								Ammonium Acetate ----ppm----					DTPA ----ppm----						% Base Saturation				
Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/ cm	Excess Lime Rating	OM LOI-%	FIA Nitrate ppm N	0-8" Nitrate Lbs N/A	M-P3 ppm P	K	Ca	Mg	Na	Ca-P Sulfate ppm S	Zn	Fe	Mn	Cu	Hot Water Boron ppm B	Sum of Cations me/100g	H	K	Ca	Mg	Na
5.7	6.6	0.18	NONE	5.2	1.7	4	9	227	2213	409	38	18	0.73	73.4	12.8	0.87	0.74	19.4	22	3	56	18	1

Introduction: The objective of this study was to evaluate the effect of RyzUp SmartGrass® applied in combinations with various surfactants on plant growth and forage production. RyzUp SmartGrass® was applied at a rate of 0.3 oz/ac with flat fan nozzles. Treatment combinations are listed in the results table below. RyzUp SmartGrass® active ingredients are shown at right. This is a small plot study conducted on-farm.

Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

Results:

	Extended Leaf Height (in.) April 30	May 11	May 21	May 27	June 2
Check	8.2 E*	11.1 C	15.0 D	16.8 A	19.6 B
Generate - 16 oz/ac	8.1 E	11.6 C	15.9 CD	16.6 A	20.8 AB
BioLink Spreader-Sticker 8 oz/100 gal	8.5 DE	11.9 C	16.1 CD	17.5 A	22.6 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	9.3 CDE	13.6 BC	18.0 ABCD	18.7 A	23.3 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	11.4 ABC	17.5 AB	21.0 AB	21.4 A	24.6 AB
RyzUp 0.3 oz + ClassAct 1.25% NG	11.8 A	17.1 AB	20.0 ABC	21.0 A	23.8 AB
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	10.4 ABCD	15.2 ABC	18.1 ABCD	19.7 A	21.9 AB
RyzUp 0.3 oz + ClassAct 2.5% NG	10.9 ABC	17.2 AB	19.6 ABCD	20.3 A	23.7 AB
RyzUp 0.3 oz + Chaperone 10 oz/ac	10.0 ABCDE	15.3 ABC	18.6 ABCD	18.9 A	22.5 AB
RyzUp 0.3 oz + FastTrack 0.5%	10.1 ABCDE	14.9 ABC	18.7 ABCD	19.8 A	24.3 AB
RyzUp 0.3 oz + UltraSurf AMS 2.5%	11.5 AB	18.6 A	22.4 A	20.5 A	25.6 A
RyzUp 0.3 oz + WetSit 0.25%	9.5 BCDE	13.2 BC	16.7 BCD	18.5 A	22.3 AB
P-Value	<0.0001	<0.0001	0.0006	0.0401	0.0515

	Natural Height (in.)		
	May 21	May 27	June 2
Check	13.9 B	16.0 AB	18.5 B
Generate - 16 oz/ac	13.9 B	15.7 B	19.7 AB
BioLink Spreader-Sticker 8 oz/100 gal	14.7 AB	16.9 AB	21.8 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	16.8 AB	18.2 AB	22.4 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	18.9 A	20.1 A	23.5 AB
RyzUp 0.3 oz + ClassAct 1.25% NG	18.7 A	19.7 AB	22.5 AB
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	16.3 AB	19.1 AB	20.6 AB
RyzUp 0.3 oz + ClassAct 2.5% NG	17.2 AB	19.5 AB	22.3 AB
RyzUp 0.3 oz + Chaperone 10 oz/ac	16.3 AB	18.3 AB	21.2 AB
RyzUp 0.3 oz + FastTrack 0.5%	16.1 AB	19.2 AB	22.9 AB
RyzUp 0.3 oz + UltraSurf AMS 2.5%	19.2 A	19.6 AB	24.2 A
RyzUp 0.3 oz + WetSit 0.25%	15.8 AB	17.6 AB	21.4 AB
P-Value	0.0038	0.0292	0.0509

	Lbs Hay/Acre		Product and
	May 21	June 24	Application Cost‡
Check	1,620 B	4,475 A	$0.00
Generate - 16 oz/ac	1,646 B	4,810 A	$17.87
BioLink Spreader-Sticker 8 oz/100 gal	1,801 AB	5,408 A	$9.88
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	2,172 AB	4,396 A	$16.88
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	2,409 A	4,954 A	$21.43
RyzUp 0.3 oz + ClassAct 1.25% NG	2,464 A	4,970 A	$19.67
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	2,311 AB	5,262 A	$29.42
RyzUp 0.3 oz + ClassAct 2.5% NG	2,189 AB	5,275 A	$24.22
RyzUp 0.3 oz + Chaperone 10 oz/ac	2,270 AB	5,014 A	$25.12
RyzUp 0.3 oz + FastTrack 0.5%	2,341 AB	5,529 A	Unknown
RyzUp 0.3 oz + UltraSurf AMS 2.5%	2,461 A	5,399 A	$22.12
RyzUp 0.3 oz + WetSit 0.25%	1,940 AB	5,155 A	Unknown
P-Value	0.0018	0.6546	N/A

*Values with the same letter are not significantly different at a 90% confidence level.

‡Product and Application Cost calculated assuming $8.12/ac ground application cost and $7.00/ac RyzUp 0.3 oz. cost. Surfactant costs vary.

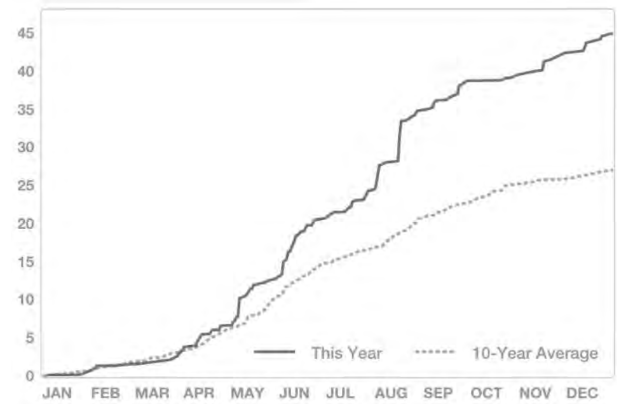
Summary: At the first harvest date on May 21, the RyzUp SmartGrass® applied with ClassAct 1.25%, UltraSurf AMS 2.5%, and Biolink 8 oz/100 gal + ClassAct 1.25% were higher yielding than the untreated check. There was no difference between the untreated check and any of the other surfactant combinations or surfactants applied alone.

The second harvest date on June 24 showed large variations in yield and resulted in no statistical yield difference between any of the treatment combinations examined.

Surfactants and RyzUp SmartGrass® on Smooth Brome

Study ID: 216023201501
County: Butler
Soil Type: Sharpsburg silty clay loam;
Harvest Date: 5/29/15 & 6/29/15
Fertilizer: Fertilizer applied broadcast prior to study initiation. Don't have the formulation or amount/acre readily available at this time.
Reps: 4

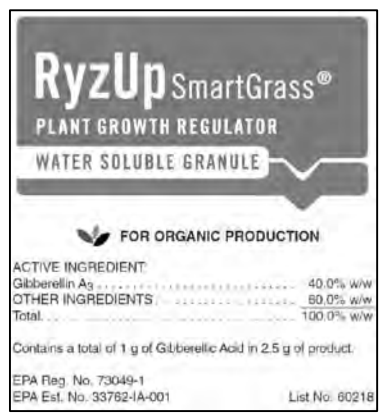
Irrigation: None
Rainfall (in.):



Soil Sample:

								Ammonium Acetate -----ppm-----					DTPA ----ppm----						% Base Saturation				
Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/ cm	Excess Lime Rating	OM LOI- %	FIA Nitrate ppm N	0-8" Nitrate Lbs N/A	M-P3 ppm P	K	Ca	Mg	Na	Ca-P Sulfate ppm S	Zn	Fe	Mn	Cu	Hot Water Boron ppm B	Sum of Cations me/100g	H	K	Ca	Mg	Na
5.8	6.6	0.25	NONE	5.8	8.5	20	7	502	2352	505	14	17	1.90	84.5	9.2	0.91	0.79	21.8	21	6	54	19	0

Introduction: The objective of this study was to evaluate the effect of RyzUp SmartGrass® applied in combinations with various surfactants on plant growth and forage production. RyzUp SmartGrass® was applied at a rate of 0.3 oz/ac on April 29 with flat fan nozzles. Treatment combinations are listed in the results table below. RyzUp SmartGrass® active ingredients are shown at right. This is a small plot study conducted on-farm.



Product information from:
http://www.valent.com/agriculture/products/ryzupsmartgrass/label-msds.cfm

Results:

	Extended Height (in.)		
	May 8	**May 19**	**May 29**
Check	11.6 F*	17.4 D	21.8 B
Generate - 16 oz/ac	12.6 EF	18.0 CD	22.7 AB
BioLink Spreader-Sticker 8 oz/100 gal	17.0 AB	17.0 D	23.3 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	14.4 BCDE	19.4 ABCD	23.5 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	17.0 AB	22.0 AB	25.6 A
RyzUp 0.3 oz + ClassAct 1.25% NG	15.1 ABCD	18.9 BCD	23.0 AB
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	16.5 AB	21.0 ABC	24.8 AB
RyzUp 0.3 oz + ClassAct 2.5% NG	17.8 A	22.4 A	24.9 AB
RyzUp 0.3 oz + Chaperone 10 oz/ac	13.5 CDEF	18.6 BCD	22.4 AB
RyzUp 0.3 oz + FastTrack 0.5%	17.0 AB	21.1 ABC	25.4 AB
RyzUp 0.3 oz + UltraSurf AMS 2.5%	16.3 AB	21.9 AB	25.2 AB
RyzUp 0.3 oz + WetSit 0.25%	15.4 ABC	20.3 ABCD	24.2 AB
P-Value	*<0.0001*	*<0.0001*	*0.0241*

	Natural Height (in.)	
	May 19	May 29
Check	16.4 AB	20.8 B
Generate - 16 oz/ac	16.5 AB	21.8 AB
BioLink Spreader-Sticker 8 oz/100 gal	15.8 B	22.2 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	17.8 AB	22.8 AB
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	19.0 A	24.4 A
RyzUp 0.3 oz + ClassAct 1.25% NG	16.6 AB	21.9 AB
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	19.1 A	23.6 AB
RyzUp 0.3 oz + ClassAct 2.5% NG	18.7 A	23.3 AB
RyzUp 0.3 oz + Chaperone 10 oz/ac	16.5 AB	21.3 AB
RyzUp 0.3 oz + FastTrack 0.5%	19.1 A	24.1 AB
RyzUp 0.3 oz + UltraSurf AMS 2.5%	18.6 A	24.1 AB
RyzUp 0.3 oz + WetSit 0.25%	17.7 AB	22.9 AB
P-Value	*0.0008*	*0.0309*

	Lbs Hay/Acre		Product and Application Cost‡
	May 29	June 29	
Check	2,970 B	6,265 A	$0.00
Generate - 16 oz/ac	3,166 AB	6,289 A	$17.87
BioLink Spreader-Sticker 8 oz/100 gal	3,432 AB	6,680 A	$9.88
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz./100 gal	3,573 AB	6,790 A	$16.92
RyzUp 0.3 oz + BioLink Spreader-Sticker 8 oz/100 gal + ClassAct NG 1.25%	3,628 AB	7,017 A	$21.43
RyzUp 0.3 oz + ClassAct 1.25% NG	3,103 AB	6,156 A	$19.67
RyzUp 0.3 oz + ClassAct 1.25% NG + Generate 16 oz/ac	3,941 AB	6,328 A	$29.42
RyzUp 0.3 oz + ClassAct 2.5% NG	3,675 AB	7,252 A	$24.22
RyzUp 0.3 oz + Chaperone 10 oz/ac	3,197 AB	6,187 A	$25.12
RyzUp 0.3 oz + FastTrack 0.5%	4,168 A	7,009 A	Unknown
RyzUp 0.3 oz + UltraSurf AMS 2.5%	3,980 AB	7,111 A	$22.12
RyzUp 0.3 oz + WetSit 0.25%	3,604 AB	6,657 A	Unknown
P-Value	*0.0314*	*0.677*	N/A

*Values with the same letter are not significantly different at a 90% confidence level.

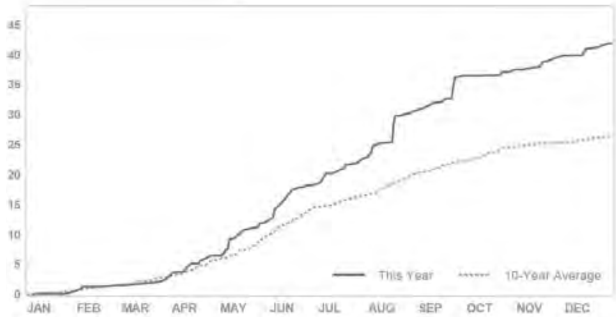
‡Product and Application Cost calculated assuming $8.12/ac ground application cost and $7.00/ac RyzUp 0.3 oz. cost. Surfactant costs vary.

Summary: At the first harvest date on May 29, the RyzUp SmartGrass® applied with Fast Track resulted in a higher yield than the untreated check. There was no difference between the untreated check and any of the other surfactant combinations examined. The second harvest date on June 29 showed large variations in yield and resulted in no statistical yield difference between any of the treatment combinations examined.

Fall Applied RyzUp SmartGrass® on Smooth Brome

Study ID: 224023201501
County: Butler
Soil Type: Hastings silt loam;
Harvest Date: 10/22/15
Reps: 4

Rainfall (in.):



Introduction: Increasing fall forage production is of interest to many area livestock producers. Utilizing fall grazing provides great benefit for area livestock producers, as natural utilization of existing forage can provide financial savings when producers do not have to purchase food stuffs and utilize machinery to mix and feed livestock. Having additional grass and extended grazing on smooth brome also can provide a 'forage bridge" until fall corn stalks are available for grazing after harvest. Additional grass forage availability is also very attractive and essential for success of the grass-fed beef industry.

Local UNL extension experimentation during 2012-2015 had noted that RyzUp SmartGrass® (active ingredient = Gibberellic acid 3; Valent USA) applications resulted in increased spring growth of smooth brome (Bromus inermis), with growth responses often evident with 7 days of application.

Experimentation in the fall of both 2013 and 2014 documented increased smooth brome growth in response to RyzUp SmartGrass® application. Fall smooth brome growth differed from that of spring applications in that untreated smooth brome had little fall growth. Data from the fall 2013 experiment also indicated that applications should be initiated several weeks sooner than in 2013 (first application Sept. 21) to realize greater grass growth differences and increase potential economic benefit. While previous fall experimentation had documented smooth brome yield and quality in response to a single rate of RyzUp SmartGrass® application at various fall dates, the objective of this experiment was to evaluate two rates as well as sequential applications.

While this product is fairly inexpensive (expected price for this product at 0.3 oz./acre is $7 + surfactant and application cost), there are no known Nebraska fall smooth brome forage/hay yield, quality or economic data for higher rates nor for sequential applications. This experiment was initiated to create some data for producers to evaluate in their decision making in future years.

Results: All RyzUp SmartGrass® applications were made with ClassAct NG surfactant at 0.7 gal/ac. Following the first application of RyzUp SmartGrass® on Sept. 3, measurements were taken on Sept. 17, prior to the second application later in the day (Table 1). Following the addition of the 2nd application on Sept. 17, height measurements were taken on Oct. 14 and 21 and yield on Oct. 22 (Table 2 and 3).

Table 1: Height measurements following Sept. 3 application.

Sept. 3 Application	Sept. 17 Natural Height (in.)	Sept. 17 Extended Leaf Height (in.)
Check (0.0 oz/ac RyzUp)	10.3 A*	12.9 AB
RyzUp 0.3 oz/ac	10.7 A	14.4 A
RyzUp 0.6 oz/ac	11.1 A	14.3 A
ClassAct NG on 9/3	10.3 A	12.7 B
P-Value	0.4495	0.0325

Table 2: Height measurements for 10 treatment combinations following both application dates.

		Natural Height (in.)		Extended Leaf Height (in.)	
Sept. 3 Application	**Sept. 17 Application**	**Oct. 14**	**Oct. 21**	**Oct. 14**	**Oct. 21**
0 oz/ac RyzUp (Check)	0 oz/ac RyzUp (Check)	9.7 AB	8.1 A	12.3 BC	12.1 CD
0.3 oz/ac RyzUp	0 oz/ac RyzUp	10.7 A	8.6 A	13.9 AB	12.3 BCD
0 oz/ac RyzUp	0.3 oz/ac RyzUp	10.1 AB	8.7 A	14.9 A	13.5 ABCD
0.3 oz/ac RyzUp	0.3 oz/ac RyzUp	10.4 A	8.2 A	14.5 AB	12.8 BCD
0.6 oz/ac RyzUp	0 oz/ac RyzUp	10.9 A	8.8 A	14.1 AB	13.4 ABCD
0 oz/ac RyzUp	0.6 oz/ac RyzUp	10.1 AB	8.9 A	14.9 A	14.4 ABC
0.6 oz/ac RyzUp	0.6 oz/ac RyzUp	9.7 AB	8.7 A	14.7 A	15.6 A
0.3 oz/ac RyzUp	0.6 oz/ac RyzUp	11.5 A	8.7 A	16.0 A	14.1 ABC
0.6 oz/ac RyzUp	0.3 oz/ac RyzUp	10.5 A	9.3 A	15.4 A	14.6 AB
Class Act 0.7 gal	0	8.3 B	7.6 A	10.5 C	11.2 D
	P-Value	*0.004*	*0.3808*	*<.0001*	*0.0002*

Table 3: Yield and treatment costs for subsequent RyzUp SmartGrass® applications at two rates.

	Yield (lb/ac) Oct. 22	**Treatment Cost† ($/ac)**
Check	2,193 A	0
RyzUp 0.3 oz/ac on 9/3	2,475 A	24.22
RyzUp 0.3 oz/ac on 9/17	2,358 A	24.22
RyzUp 0.3 oz/ac on 9/3 and 9/17	2,656 A	48.44
RyzUp 0.6 oz/ac on 9/3	2,490 A	31.22
RyzUp 0.6 oz/ac on 9/17	2,523 A	31.22
RyzUp 0.6 oz/ac on 9/3 and 9/17	2,460 A	62.44
RyzUp 0.3 oz/ac on 9/3 and 0.6 oz/ac on 9/17	2,613 A	55.44
RyzUp 0.6 oz/ac on 9/3 and 0.3 oz/ac on 9/17	2,476 A	55.44
ClassAct NG on 9/3	1,873 A	17.22
P-Value	0.6391	

*Values with the same letter are not significantly different at a 90% confidence level.

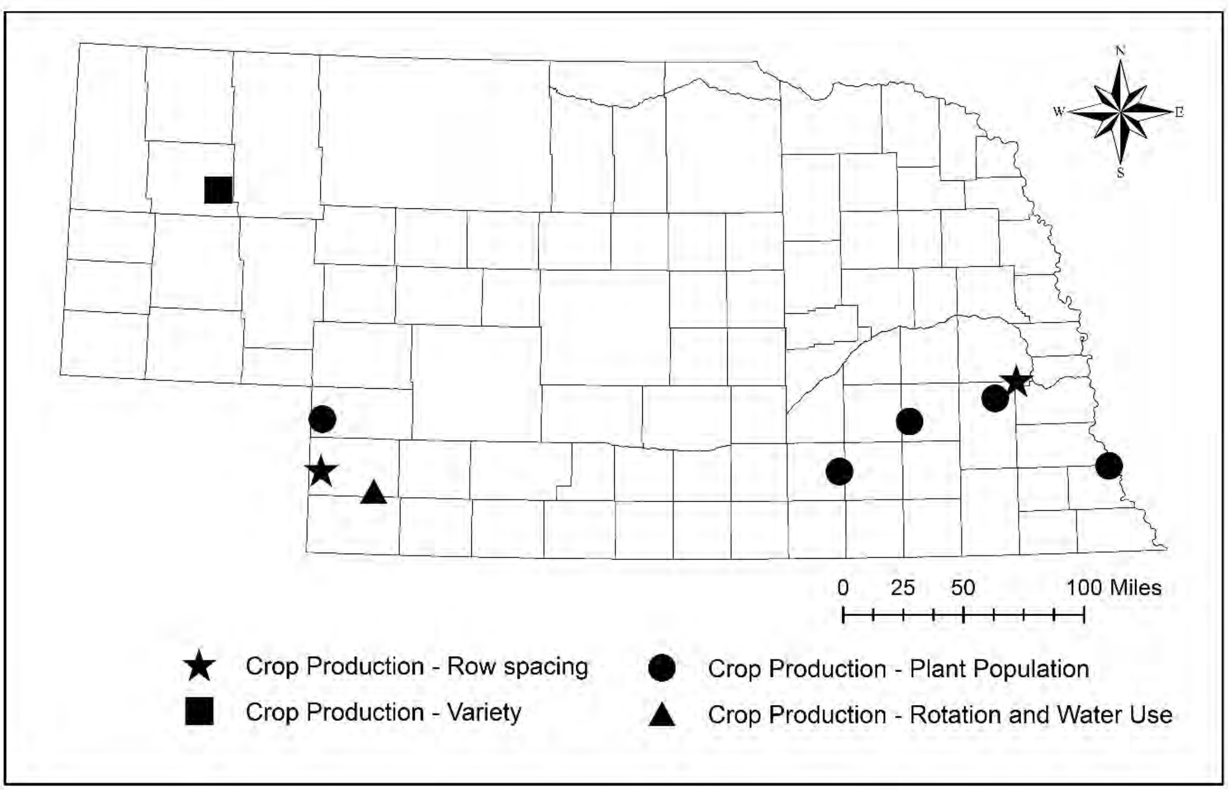
‡Treatment cost includes product cost and $8.12/ac application cost.

Summary: Data collected on Sept. 17, following the first application, showed no treatment having greater natural or extended forage height than the untreated check.

Following the second application on Sept. 17, height data was collected on Oct. 14 and 21. None of the treatment combinations resulted in greater natural height than the check, however, there were several treatments that resulted in greater extended height than the check on both Oct. 14 and 21 (see results table). None of the treatments resulted in greater hay yield (lb/ac) than the untreated check.

CROP PRODUCTION

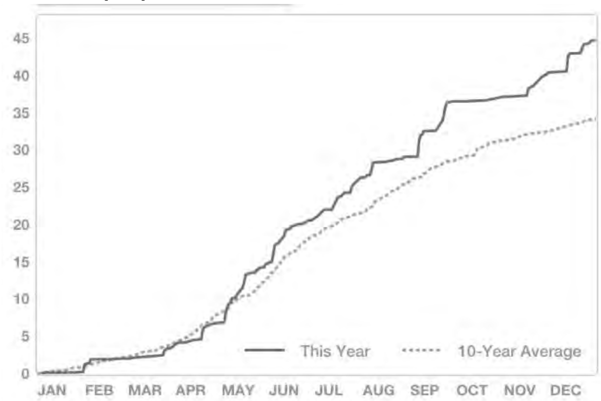
- Rainfed Corn Population Study
- Rainfed Corn Population Study
- Rainfed Corn Population Study – Variable Rate Seeding
- Irrigated Soybean Population Study
- Soybean Row Spacing (15" vs 30")
- Soybean Row Spacing (15" vs 30") – multi-state USB project
- Sustainability of Replacing Summer Fallow with Grain-type Field Peas in Semiarid Cropping Systems
- Field Pea Planting Population
- Dry Bean Direct Harvest Variety Study



Rainfed Corn Population Study

Study ID: 027127201501
County: Nemaha
Soil Type: Blencoe silty clay;
Planting Date: 4/11/15
Harvest Date: 10/05/15
Population: 28-40,000
Row Spacing (in.) 30
Hybrid: DKC67-58RIB
Reps: 6
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 13 oz/ac Authority MTZ ***Post:*** 32 oz/ac Roundup WeatherMax, 1 lb/ac Symbol/Advance, 0.250 gal/ac Brandt SmartTrio, and 1.7 lb/ac AMS on 7/1/15 (http://www.unitedsuppliers.com/Products/Symboladvance, http://www.agrian.com/pdfs/Brandt_Smart_Trio_Label2.pdf)
Seed Treatment: Acceleron 250 Fungicide
Foliar Insecticides:
Foliar Fungicides: 5 oz/ac Fortix on 7/1/15 (w/ Post Herb)
105 oz/ac Quilt Xcel, 1 gal/ac SRN-28, 2 pt/ac Symbol/Release, and 2 oz/ac Wet-Cit on 7/16/15 (http://www.unitedsuppliers.com/Products/Symboladvances)
Fertilizer: 70 lb/ac 11-52-0, 1.7 lb/ac 00-00-60, and 1.3 lb/ac Zinc Sulfate 35.5% VRT Dry on 11/17/14.
59 lb/ac 11.65-0-0-25.24 Winter Blend and 170 lb actual N/ac as 32-0-0 on 11/18/14.
100 lb actual N/ac as 32-0-0 on 6/4/15.

Irrigation: None
Rainfall (in.):



Introduction: This is a continuation study which started during the 2010 growing season. The purpose of this study was to determine the corn plant population which was the most profitable. The populations chosen to be evaluated this year and in previous years were determined by the grower. The field associated with this study is sub-irrigated.

Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac)‡
28,000 seeds/acre	239 AB*	19.5 A	26,533 D	784.85
32,000 seeds/acre	233 B	19.6 A	30,400 C	750.45
36,000 seeds/acre	233 B	19.5 A	34,137 B	737.95
40,000 seeds/acre	246 A	19.5 A	38,033 A	772.90
P-Value	0.0117	0.252	<0.001	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn and $250/bag seed corn (80,000 seed count).

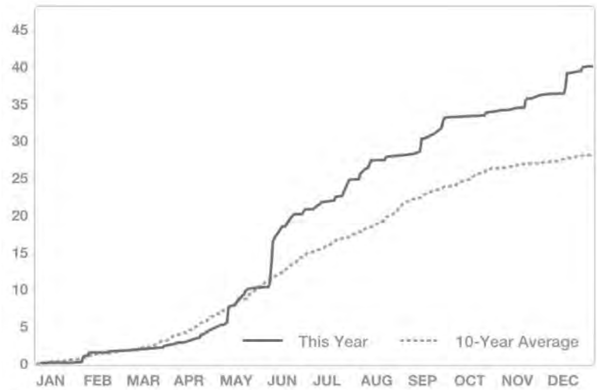
Summary: There was no difference in harvest grain moisture between the four planting populations. The 40,000 seeds/acre seeding rate was higher yielding than the 36,000 and 32,000 treatment. However there was no statistical yield difference between the 40,000 seeds/acre and 28,000 seeds/acre treatment. In this case planting 28,000 seeds/acre maximized marginal net return.

These results only represent one year and one growing location and are inconsistent with results from other on-farm and small-plot research studies from other years and locations. It is important to look at multiple years and locations when using this information for making production decisions.

Rainfed Corn Population Study

Study ID: 011035201501
County: Clay
Soil Type: Butler silt loam; Hobbs silt loam;
Planting Date: 4/24/15
Harvest Date: 10/20/15
Population: 22,000/26,000
Row Spacing (in.) 30
Hybrid: DKC 62-78 RIB
Reps: 31 (yield and moisture), 8 for stand counts
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** Lexar E2 - Full broadcast rate on 4/29/15 (w/ fertilizer) ***Post:*** unknown
Seed Treatment: None
Foliar Insecticides: None
Foliar Fungicides: None

Fertilizer: 5 gal/ac 10-34-0 and 1 qt/ac zinc at planting - 4/24/15 (on seed);
130 lb/ac 32-0-0 on 4/29/15 (broadcast with chemical + Agrotain)
Irrigation: None
Rainfall (in.):



Soil Sample Results:

						Nitrate-Nitrogen			Mehlich 3 ICP ---------ppm-----------					DTPA Ppm		Cation Exchange Capacity -----------%---------------				
Sample Depth	Soil pH 1:1	Buffer pH	Sol Salts, mmho/cm	Exces s Lime	% OM	ppm	lb N/ac	MP-3 ppm	K	S	Ca	Mg	Na	Zn	CEC	H	K	Ca	Mg	Na
0-8	6.2	6.7	0.20	No	2.6	5	12	28	424	11	1780	281	24	0.7	16	22	7	56	15	1

Introduction: These growers have traditionally planted 22,000 seeds/acre on their rainfed corn fields. They are considering increasing their seeding rate for their dryland corn fields. The objective of this study was to determine if increasing their seeding rate to 26,000 seeds/acre would result in increased yield and ultimately increased profitability.

Results:

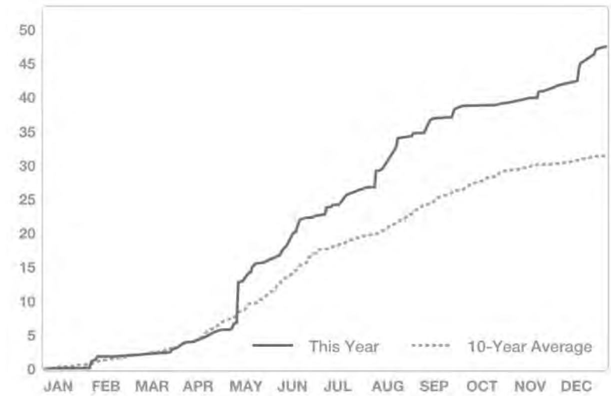
	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac)‡
22,000 seeds/acre	184 B*	13.4 A	21,500 B	596.13
26,000 seeds/acre	191 A	13.3 B	24,875 A	607.96
P-Value	<0.0001	0.0053	0.0001	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn and $274.45/bag seed corn (80,000 seed count).

Summary: Increasing the seeding rate to 26,000 seeds/acre resulted in a statistically significant increase in yield (7 bu/ac), which covered the cost of the additional seeds.

Rainfed Corn Population Study - Variable Rate Seeding

Study ID: 030109201502
County: Lancaster
Soil Type: Pawnee clay loam; Yutan silty clay loam; Aksarben silty clay loam;
Planting Date: 4/28/15
Harvest Date: 10/22/15
Population: Avg. 29,000
Row Spacing (in.) 30
Hybrid: DKC 62-97
Reps: 12
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 2.1 qt/acre Bicep ***Post:*** 1.8 oz/acre Callisto and 1 qt/ac Roundup
Seed Treatment: unknown
Foliar Insecticides: None
Foliar Fungicides: None
Fertilizer: 160 lbs/acre actual N as anhydrous ammonia, Fall 2014
Note: Some stand loss due to heavy spring rains.
Irrigation: None
Rainfall (in.):



Introduction: With the capability to variable-rate seed, more farmers are trying this technology out in their fields. For this study, management zones were developed by using a compositive of historic yield maps. Three seeding rates were used (24,000, 29,000 and 34,000 seeds/acre) in the variable rate prescription map. In order to evaluate the result of the variable-rate seeding, strips of a flat seeding rate of 29,000 seeds/acre were placed throughout the field in a paired-comparison design. Because the same amount of seed was used on the variable-rate seeding areas, the seed cost for the single rate and variable-rate areas was the same in this case. This study was a continuation of a similar effort in 2013 and 2014. The objective of this study was to determine if using a variable-rate prescription based on productivity zones can increase profitability.

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Standard Rate 29k seeds/acre	200 A*	13.9 A	730.00
Variable Rate 24k-29k-34k seeds/acre	200 A	13.9 A	730.00
P-Value	0.8748	0.9376	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn. Seed costs between the treatments was the same and was therefore not taken into account.

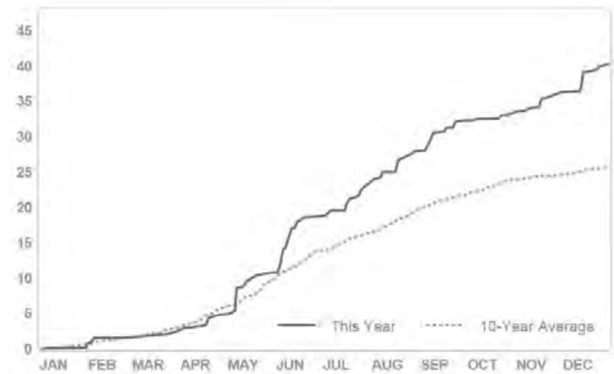
Summary: Similar to results in previous years, there was no significant yield or moisture difference between the variable-rate seeding prescription and the standard 29,000 seeding rate.

Irrigated Soybean Population Study

Study ID: 006159201501
County: Seward
Soil Type: Hastings silt loam; Fillmore silt loam;
Planting Date: 5/13/15
Harvest Date: 10/7/15
Population: 120-150-180
Row Spacing (in.) 10
Hybrid: Channel 3402r2
Reps: 4
Previous Crop: Seed Corn
Tillage: No-Till
Herbicides: ***Pre:*** 3.2 oz/ac Authority First, 8 oz/ac 2-4,D and 22 oz/ac PowerMax on 4/15/15 ***Post:*** 32 oz/ac PowerMax, 0.8 oz/ac Cadet, 1.5 qt/ac Warrant, and 6 oz/ac Avatar on 6/21/15;
30 oz/ac PowerMax and 10 oz/ac UltraBlazer on 7/8/15
Seed Treatment: Dealer applied fungicide and insecticide

Foliar Insecticides: none
Foliar Fungicides: none
Fertilizer: none

Irrigation: Pivot, Total: 4"
Rainfall (in.):



Soil Sample:

Sample	pH	Buffer pH	% OM	NO3-N Ppm 0-2’	Legume or Cover Crop	Lbs N Avail	P 1 ppm	P1 Level	K ppm	K level	Zn ppm	Zn level	S ppm	S level
1	5.5	6.6	3.3	10.3	25	118	22	H	281	VH	0.9	M	7	L
2	5.7	6.7	3.2	11.2	25	126	24	H	276	VH	1.1	H	9	L
3	5.8	6.9	3.2	9.9	25	114	21	H	296	VH	1.3	H	8	L
4	5.6	6.6	3.1	10.7	25	121	17	M	301	VH	1.1	H	8	L
5	5.6	6.7	3.2	8.9	25	105	18	M	297	VH	0.9	M	8	L
6	5.8	6.8	3.3	8.3	25	100	21	H	288	VH	1	H	10	M

Introduction: Previous on-farm research has demonstrated that planting rates of 80,000 to 120,000 seeds/acre generally result in the highest profitability. The purpose of this study was to determine the most profitable soybean seeding rate. The populations chosen in this study are common to growers in the area. Soybeans were drilled in 10" rows on May 13, 2015.

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
120,000 seeds/acre	77 A*	11.7 A	644.16
150,000 seeds/acre	76 AB	11.6 A	624.97
180,000 seeds/acre	75 B	11.7 A	605.79
P-Value	0.0906	0.8206	N/A

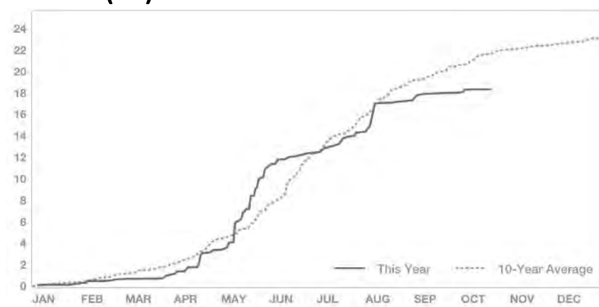
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $48/unit seed (140,000 seeds/unit).

Summary: No yield increase was seen for planting higher than 150,000 seeds/acre. Based on the cost of seed, planting 120,000 seeds per acre rate maximized net returns.

Soybean Row Spacing (15" vs 30")

Study ID: 179029201501
County: Chase
Soil Type: Valent loamy sand; Valent sand;
Planting Date: 5/26/15
Harvest Date: 10/12/15
Population: 150,000
Row Spacing (in.) 30
Hybrid: Asgrow 2733
Reps: 6
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** 7 oz/ac Anthem on 5/5 ***Post:*** 32 oz/ac of RoundUp and 4 oz/ac Dual II Magnum on 6/20
Seed Treatment: Inoculant
Foliar Insecticides: none
Foliar Fungicides: none

Fertilizer: Triple nickel 8-20-5-5 (S) -0.5 (Zn) at 15 gal/ac or 155 lb/ac and 102 lb/ac dry potash 60% K2O on 5/27;
10 gal/ac 32-0-0 AMS with glyphosate on 6/20;
10 gal/ac 26-0-3-5 sulfur with chemigation on 7/6
Note: less volunteer corn observed in 15 inch rows
Irrigation: Pivot, Total: 12.75"
Rainfall (in.):



Introduction: Research from UNL's Soybean Management Field Days showed a yield benefit for 15" row spacing compared to 30" rows. In this study, the grower wanted to look at yield effects due to 15" and 30" row spacing in their own soybean field.

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Row Spacing 15"	78 A*	694.20
Row Spacing 30"	74 B	658.60
P-Value	*0.0024*	*N/A*

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans.

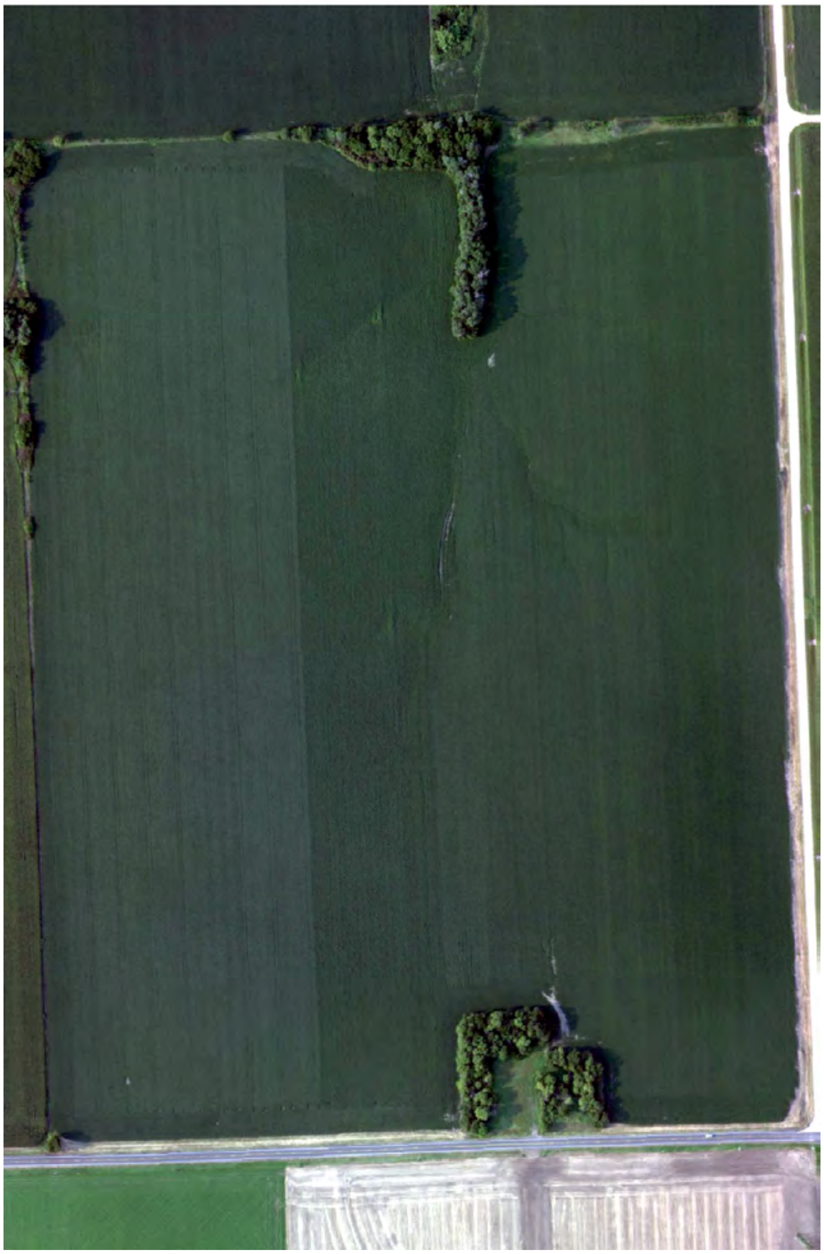
Summary: Results of this study showed a significant 4 bu/ac yield increase for the 15" row spacing treatment. This resulted in an increase in net return.

Soybean Row Spacing (15" vs 30")

Report ID: 176155201501

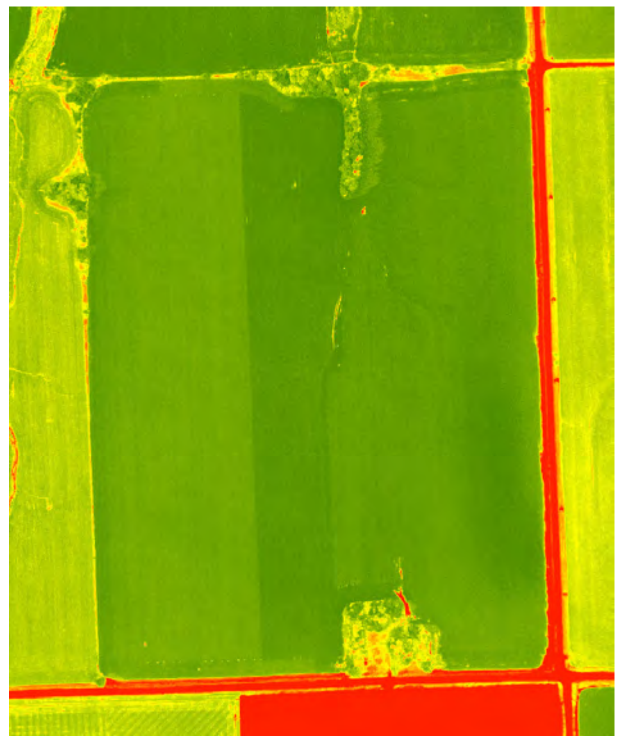
This study was conducted as part of a multi-state on-farm research pilot project sponsored by the United Soybean Board. This report is adapted from the project and is reproduced with permission. This is a Soybean Crop Management - Row Spacing trial comparing 15" rows vs. 30" rows, located in Saunders County, Nebraska. The trial was established by planting with a 30" row planter and then double planting for the 15" treatments.

<u>Aerial Imagery Flown August 26, 2015</u>

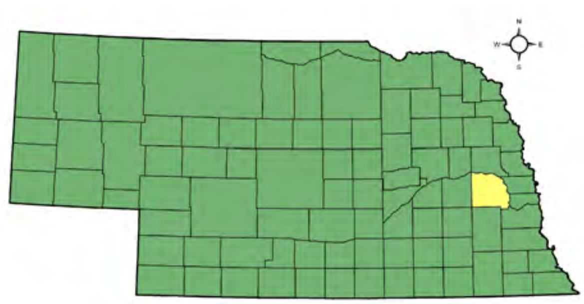


Natural Color

0 250 500 1,000 Feet

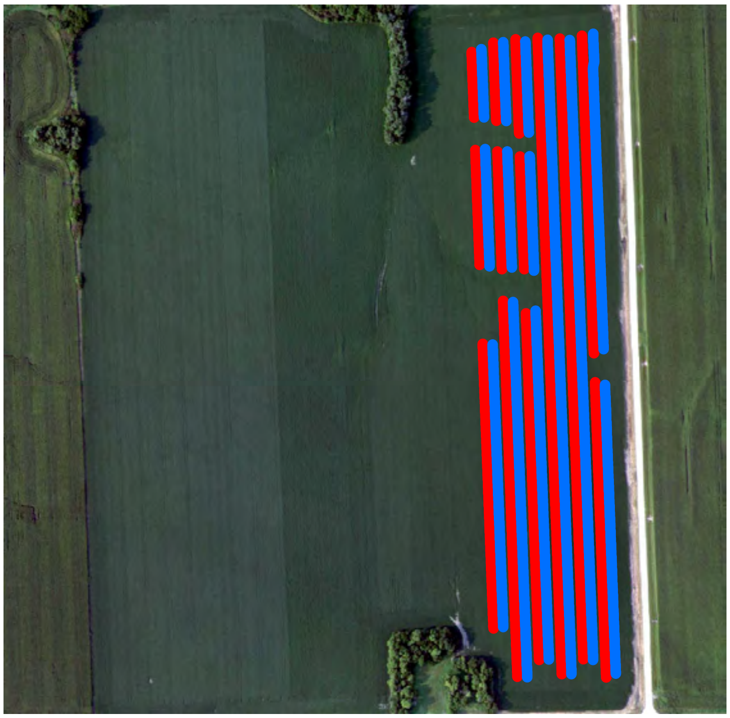


NDVI



Saunders County, NE

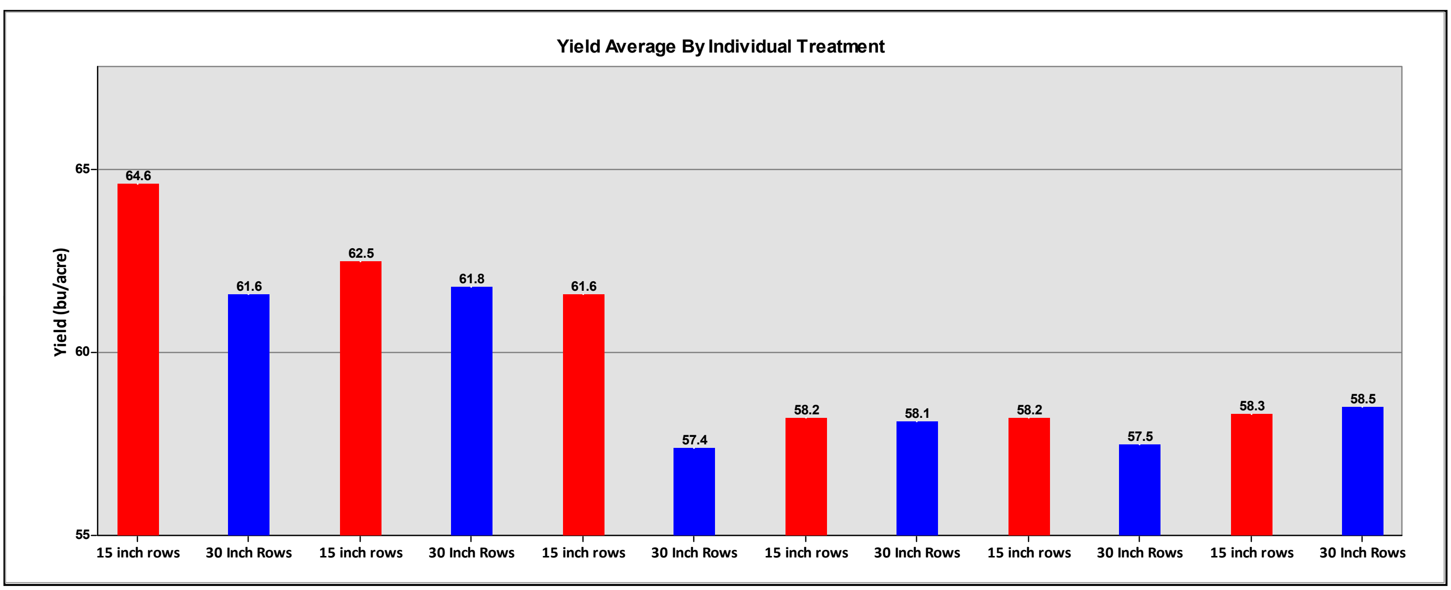
Treatment Layout and Results



Trial Type	Crop Management - Row Spacing
Trial Detail	15" rows vs 30" rows
Planting Date	6/2/2015
Harvest Date	10/12/2015

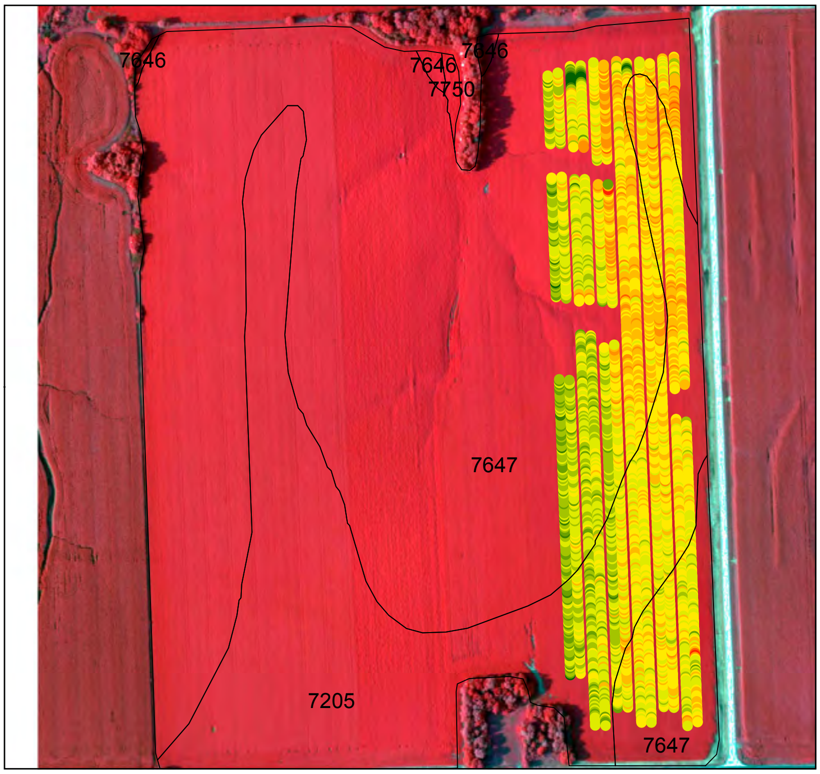
Treatment

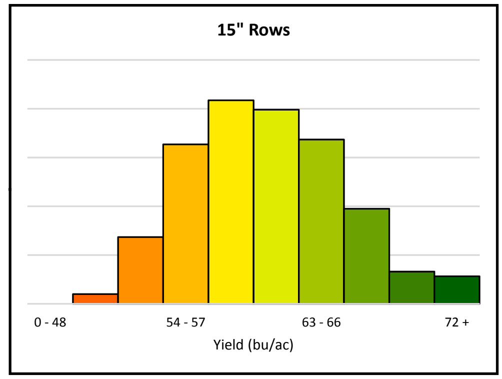
- 15 inch rows
- 30 Inch rows

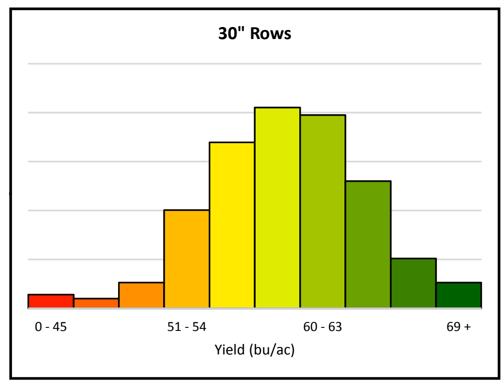


Treatment	15 inch rows	30 inch rows	
Yield Averages (bu/acre)	60.6	59.2	Yield difference is not statistically significant at 10% significance level.

Grain Yield with Soil Survey





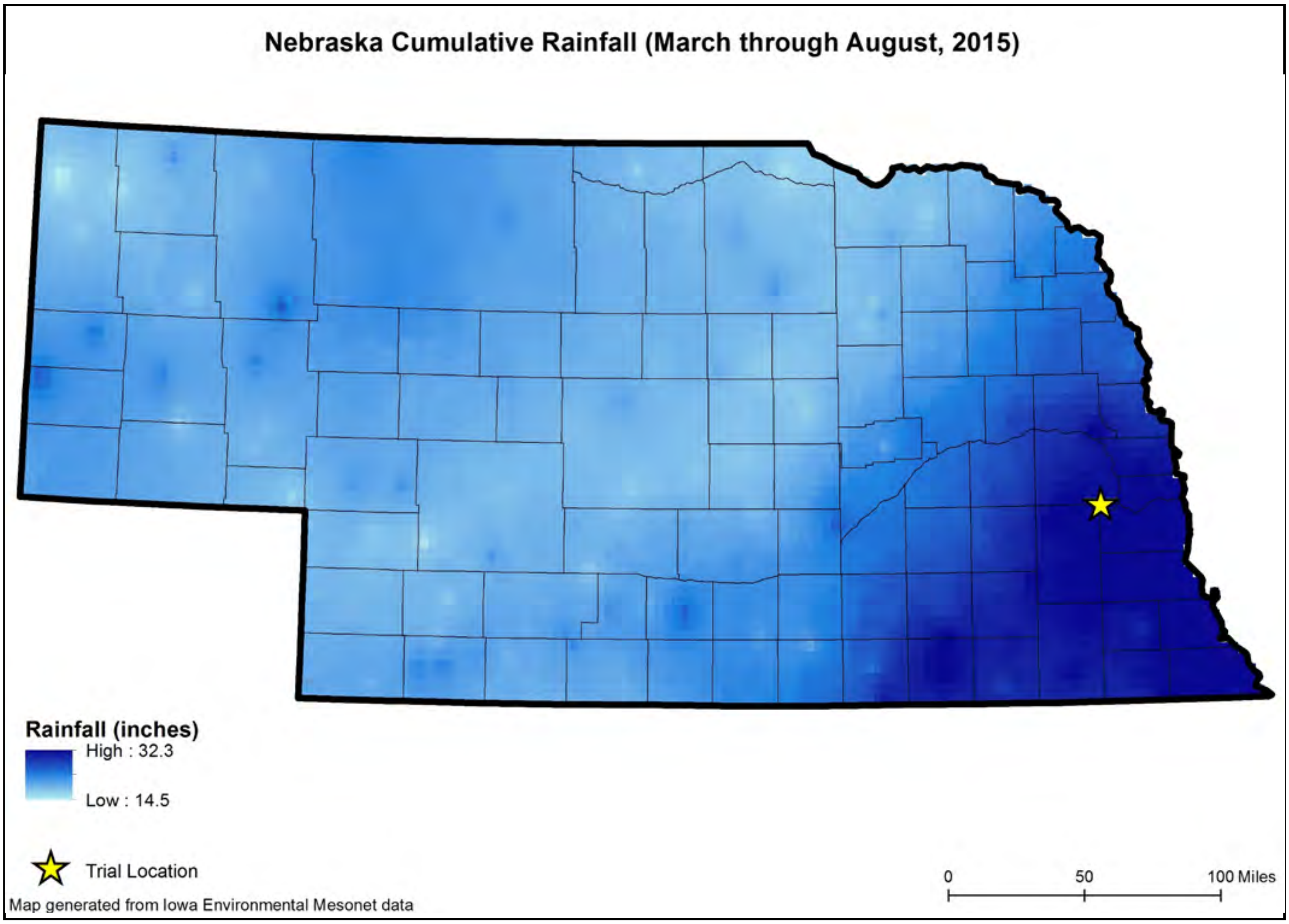


Yield By Treatment and Soil Map Unit						
	Map	Percent of Trial		Yield (bu/acre)		Yield*
Soil Map Unit	Symbol	15" rows	30" rows	15" rows	30" rows	Difference
Aksarben silty clay loam, 0 to 2 percent slopes	7205	36.3	38.2	59.9	58.9	1.0
Yutan, eroded-Aksarben silty clay loams, 2 to 6 percent slopes	7647	63.7	61.8	60.6	59.1	1.5

*Yield differences calculated for Soil Map Units that have relatively small areas might not be representitive of the treatments.

Harvest Variables and Rainfall

Harvest Variable	Treatment 15" rows	Treatment 30" rows	Variable Differences
Combine Speed (mph)	4.3	4.4	0.1
Grain Moisture (%)	9.2	9.4	0.2



Additional information not included in the multi-state report:

Early (early July) and late (late September) stand counts were taken for 3 of the replications. Within each replication, 3 sub samples of data were collected. Plants were staked so that the same plants were counted at both early and late counting dates. Results in the table below show that at the early season stand count, the 15" row spacing had lower stand counts, but by later in the season this difference no longer existed. It was noted that the 15" row spacing treatment had slower emergence, particularly in areas where there was greater wheel traffic resulting from the planter doubling back to establish the 15" treatment.

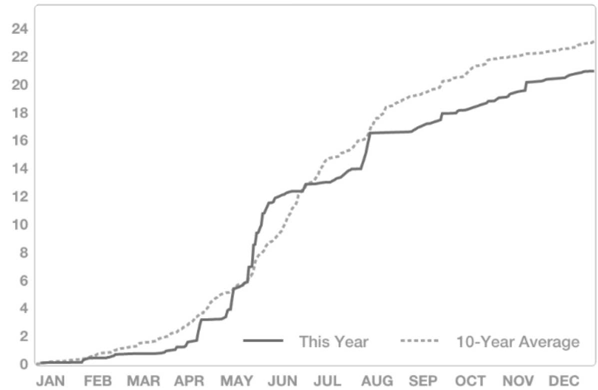
	Early Season Stand Counts	Late Season Stand Counts
15"	112,889 B*	105,667 A
30"	120,000 A	111,222 A
P-Value	0.0903	0.3296

 * Values with the same letter are not significantly different at a 90% confidence level.

Sustainability of Replacing Summer Fallow with Grain-type Field Peas in Semiarid Copping Systems

Study ID: 174029201501
County: Chase
Soil Type: Blackwood loam;
Field peas Planting Date: 3/27/2015
Field peas Harvest Date: 7/20/2015
Wheat planting date: 9/14
Population: 180 lb/ac
Row Spacing (in.): 10
Cultivar: Salamanca
Reps: 9
Previous Crop: corn
Tillage: No-Till
Farm inputs: in table below

Rainfall (in.):



INTRODUCTION:

Using cover crops to improve soil quality in semiarid environments of western Nebraska where water is the major yield limiting factor may not be economically justified. In adition, sustaining no-till summer fallow has been an ongoing struggle for farmers in western Nebraska due to evolution of herbicide-resistant weeds and the absence of new herbicide Modes of Action (MOA) in the past 25 years. Growing grain-type field peas (cool-season legume) instead of no-till summer fallow may provide solutions to this problem as it can: (1) reduce the number of herbicide applications, delay the evolution of herbicide-resistant weeds and preserve no-till summer fallow; (2) provide rotational benefits through N fixation, improve soil physical properties and increase biodiversity above and below ground; and (3) generate profit. Trade-offs are associated with the possibility of field peas leaving dry soil behind them, which depending on precipitation and soil moisture status may hurt the yield of the succeeding wheat crop (yield penalty may equal 5-6 bu/ac/inch).

Figure 1: Field peas planted following corn had good establishment and nodulation.

OBJECTIVE:

The objective of this 2-year rotational study was to compare the impact of field peas vs fallow on water use, soil fertility, beneficial insects, yield of succeeding wheat crop, and profitability.

RESEARCH METHOD:

Study was set as pairwise comparison of field peas vs fallow with 9 replications. Actual evapotranspiration (ET, i.e. **water use**) was estimated using soil water balance method: ET = Rain + Soil water at beginning – Soil water at end – Runoff – Deep percolation. **Soil fertility** was evaluated for both treatments by testing soil samples for NO3-N, P, K, organic matter, and microbial activity throughout the season. **Beneficial insects** were collected using pitfall traps and nets (nets only in field peas) 2 times during the growing period. **Profitability** was calculated for both treatments based on: current price of field peas on the market ($5.5/bu), actual costs of farm inputs (seed, fertilizer, herbicides, etc.), and farm operations (planting, spraying, harvest) based on UNL crop budgets in 2016. Effects of treatments on wheat yield is yet to be evaluated. Only soil fertility, water use and profitability data will be reported here.

RESULTS:

Field peas were well established and displayed good emergence and nodulation (Figure 1).

Soil samples from field peas and fallow showed no difference in actual nutrient concentration (Table 1). However, a Solvita test taken just prior to planting wheat indicated higher soil-microbial activity and greater annual N release in parts of the field where field peas were grown (Table 1).

Table 1. Seasonal changes in NO3-N, P, K, and OM in field peas and fallow

date	depth (in)	Treatment	NO3-N	P1	K	OM
	inches		lb/ac	ppm	ppm	%
Mar 27, 2015	0-8	Field peas	20	23	389	1.7
		Fallow	19	26	365	1.7
Sep 14, 2015	0-8	Field peas	33	102	966	1.9
		Fallow	34	82	1066	2.1
Oct 16, 2015	0-12	Field peas	60	24	424	1.8
		Fallow	40	14	361	1.6
	13-24	Field peas	43	13	442	1.4
		Fallow	95	90	431	1.7
	25-36	Field peas	35	9	340	1.4
		Fallow	47	9	519	1.3

date	depth (in)	Treatment	CO2-C	N release/year
	inches		ppm	lb/ac
Oct 16, 2015	0-12	Field peas	52	42
		Fallow	28	22

Water use data indicated that field peas used 10.9 inches of water to produce 36 bu/ac yield (water productivity = 3.3 bu/ac), leaving 6.9 inches of soil moisture at the time of harvest (2.9 inches < fallow). Following harvest, (until 11-15-2015) there was enough time to allow the soil moisture profile to refill with 5.3 inches (1.7 + 3.6) of rain and ensure good winter wheat crop establishment (Table 2). Conversely, the fallow treatment lost 6.0 inches through deep percolation and evaporation while field peas were growing, produced no yield, and did not have capacity to store 5.6 inches of rainfall (Table 2).

Table 2. Temporal changes in soil moisture status (in inches) in top 3 foot of soil, rain, ET, field peas water productivity of field peas and fallow during 2015 growing season

Period	Treatment	beginning soil moisture	Rain	ending soil moisture	ET	Yield (bu/ac)
3-27 to 7-20	Field peas	10.0	12.1	6.9	10.9	36
	Fallow	10.0		9.8	6.0	
7-20 to 9-14	Field peas	7.0	1.7	7.8	**Water Productivity (Yield/ET) = 3.3 bu/inch**	
	Fallow	10.0		10.0		
9-14 to 11-15	Field peas	7.8	3.6	adequate		
	Fallow	10.0		adequate		

3-27-2015 field peas planted, 7-20-2015 field peas harvested, 9-14-2015 wheat planted

A **Profitability** analysis showed that raising 36 bu/ac field peas and selling them at $5.50/bu market price generated a profit of $54/ac, while the fallow treatment cost $57. This resulted in a $111/ac difference in the farmers' potential income. Further economic analysis will be performed after wheat harvest and will take into account potential benefits from increased microbial activity and a higher N release rate that was observed where field peas were grown.

Table 3. Profitability per acre of field peas vs fallow

Field peas			Fallow		
Date	Input	Cost ($/ac)	Date	Input	Cost ($/ac)
3-27-2015	Planting	11.2	6-3-2015	Spraying	4.2
	Spraying	4.2		Burndown herbicide	14.9
	Seed	45.0	7-15-2015	Spraying	4.2
	Inoculant	12.0		Burndown herbicide	14.9
	PRE herbicide	28.2	8-21-2015	Spraying	4.2
7-20-2015	Harvest	24.1		Burndown herbicide	14.9
9-3-2015	spraying	4.2		SUM	57
	herbicide	14.9		**PROFIT**	**-57**
	SUM	144			
	PROFIT	**+54**			

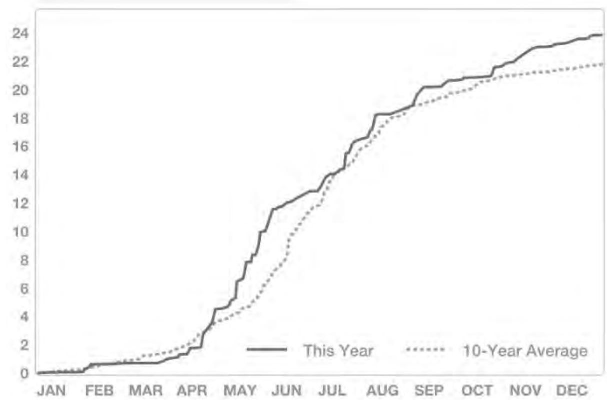
CONCLUSIONS

Field peas have the potential to be used as an alternative to no-till summer fallow in wheat-fallow and wheat-corn-fallow rotations to increase sustainability. Results from this year showed that field peas had better water utilization, higher soil microbial activity, and were more profitable than fallow. It is also important to mention that this year's weather conditions (i.e. wet year) favored field peas over fallow. Consequently, this research needs to be replicated in dry years to capture worst case scenarios. Nevertheless, no-till summer fallow will remain an important water conservation practice in western Nebraska.

Field Pea Planting Population

Study ID: 175135201501
County: Perkins
Soil Type: Rosebud loam;
Planting Date: 5/1/2015
Harvest Date: 7/28/2015
Row Spacing (in.) 10
Cultivar: DS Admiral
Reps: 4
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** NA ***Post:*** 32 oz/ac RoundUp applied after planting and before emergence.
Seed Treatment: Cell Tech liquid inoculate
Foliar Insecticides/Fungicide: None
Fertilizer: None

Irrigation: None, Total: N/A
Rainfall (in.):



INTRODUCTION: Grain-type field peas are a cool season grain crop (grown mid-March to late-July). They are typically grown as an alternative to no-till summer fallow in a semiarid, cereal-based, no-till cropping system such as a wheat-corn-fallow and/or wheat-fallow rotation. Replacing summer fallow with field peas provide numerous benefits: (1) easy implementation –modifications to crop rotation or farm equipment are not necessary, (2) breaking weed and pest cycles, thereby reducing the number of herbicide/pesticide applications and delaying evolution of resistance in troublesome weeds/pests; (3) gaining rotational benefits such as N fixation (10-24 lb/ac), increasing soil organic matter, elevating populations of beneficial insects and soil mycorrhizal fungi, (4) achieving better water utilization by allowing sufficient time for summer rains to recharge soil profile and ensure good winter wheat establishment; and (5) increasing profitability. Trade-offs are that field peas may deplete soil moisture and potentially hurt the yield of the succeeding wheat crop (yield penalty = 5-6 bu/ac/inch), especially in dry years.

Agronomic recommendations for growing field peas come mostly from University research done in Canada, the Northern U.S., and the Pacific Northwest. Very little information is available on how field peas respond to different agronomic practices in semiarid Nebraska. Therefore, **the objective of this study was to determine the optimum planting population for field peas in western Nebraska.**

RESEARCH METHODS: Field peas were planted on May 1 targeting seven planting populations including an optimal population of 311,000 plants/ac and three populations over and under that recommendation (Table 1). Due to only a 60% germination rate, yield responses were plotted against the actual number of plants/ac that were taken from mid-season stand counts. Data was analyzed using asymptotic regression model:

$$Y = c + (d - c)(1 - \exp(-X/e))$$

where, Y is crop yield (bu/ac), X is plant population (plants/ac), the parameter c is the lower limit (at x = 0) and was set to 0, the parameter d is the upper limit and the parameter $e > 0$ is determining the steepness of the increase as X.

Table 1. Seven targeted field peas populations for during field studies in Southwest Nebraska in 2015.

Populations	targeted population	adjusted for 90% germ	lb/ac
1	100,000	111,111	56
2	170,000	188,889	94
3	240,000	266,667	133
4	310,000	344,444	172
5	380,000	422,222	211
6	450,000	500,000	250
7	520,000	577,778	289

RESULTS:

Data was analyzed in R software using drc package (Ritz, C. & Streibig, J. C. (2005) Bioassay Analysis using R. J. Statist. Software, Vol 12, Issue 5.)

Results show that **yield response to plant population** is linear at low populations. The response then begins to plateau as population increases (>150,000 plants/ac), and reaches its maximum yield at approximately 310,000 plants/ac (Figure 1-left). At populations over 310,000 plants/ac, only negligible yield increase occurs (Figure 1-left).

Difference in yield response in **low and high yielding environments** was also observed. This suggests that planting higher populations in high-yielding environments and lower populations in low-yielding environments is justified to optimize yield and maximize economic benefit (Figure 1-left).

The **economically optimal population (EOP)** can be defined as the population that maximizes profit made on investment, which in this case is seed. Thus, planting populations that maximize yield potential are often not economically justified due to the nature of the asymptotic yield response, and will most likely result in profit reduction (Figure 1-right).

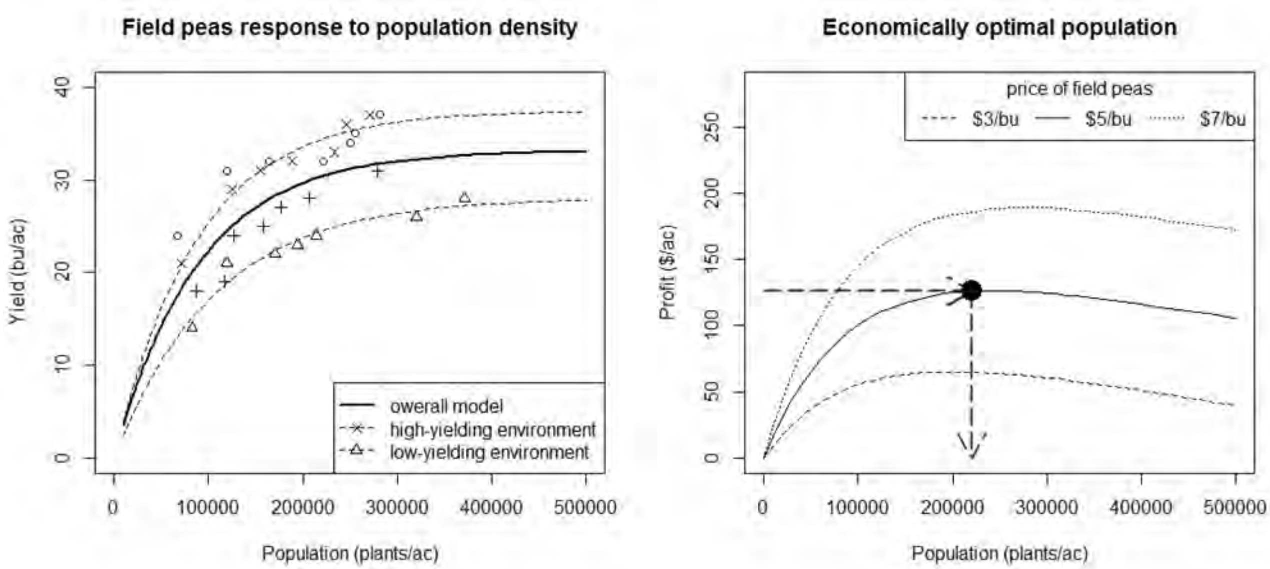


Figure 1. Field peas response to population density: overall model, model for low yielding environment, and model for high-yielding environment (left); Economically optimal population: profitability as affected by field peas population and price of field peas on the market (right)

The economic analysis assumes that:

1. field pea varieties have 2100 seeds/lb, 60 lb/bu, and a 90% germination rate,
2. a hail event or some other population reduction factor does not occur,
3. the price to purchase certified field pea seed is equal to $15/bu, and
4. the market price of field peas is $5.00/bu.

The analysis is also based on data from only one year and location.

Under these assumptions, EOP (i.e. maximum profit) for field peas is 116 lb/ac, and an approximate $19 profit penalty will occur for each pound planted over this EOP (Table 2). The curent recommendation for planting populations is 200 lb/ac; these results indicate farmers can save up to $16/ac when planting at the EOP. Refer to Table 2 for determining EOP under a few different scenarios.

CONCLUSIONS:

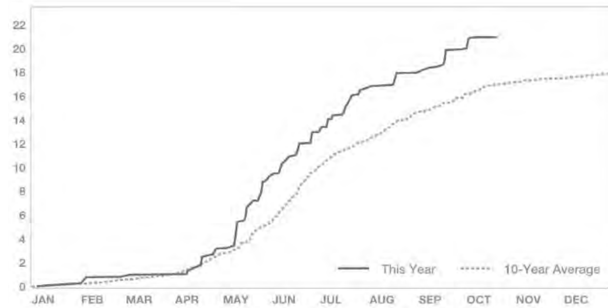
Although this study shows potential for reducing field pea populations without hurting profits, planting populations of ≥ 180 lb/ac are justified due to potential risk factors associated with reducing plant populations (e.g. poor germination, hail event). This demonstrates the necessity for additional data from multiple years and locations that would support the yield response to population that was seen this year.

Table 2. Economically optimal population (EOP) and profit for field peas when planting certified seed with 90% germination and bin-run seed with 80% germination at different market price market.

	Certified see with 90% germination			**Bin-run seed with 80% germination**		
Market price	**Profit**	**EOP**	**EOP**	**Profit**	**EOP**	**EOP**
$/bu	$/ac	plants/ac	lb/ac	$/ac	plants/ac	lb/ac
3	63	180000	95	81	230000	137
5	123	220000	116	145	280000	167
7	185	240000	127	210	310000	185

Dry Bean Direct Harvest Variety Study

Study ID: 152013201501
County: Box Butte
Soil Type: Creighton very fine sandy loam; Alliance loam; Duroc loam; Keith loam;
Planting Date: 6/15/15
Harvest Date: 9/17/15
Population: approx. 120,000
Row Spacing (in.) 15
Hybrid: Varies-being studied
Reps: 4
Previous Crop: Corn
Tillage: Disked once and rolled before planting
Herbicides: ***Pre:*** 30 oz/ac Prowl and 15 oz/ac Outlook
Post: 4 oz/ac Raptor and 25 oz/ac Basagran
Seed Treatment: Apron XL, Maxim, Rancona, Dynasty
Foliar Insecticides: None
Foliar Fungicides: None
Fertilizer: 40 lbs N
Note: Desicant/harvest aid: 25 oz/ac Roundup, 2 oz Sharpen, 10 gallons of 32 N
Irrigation: Pivot, Total: 6"
Rainfall (in.):



Introduction: The purpose of this study was to compare 4 different Pinto bean varieties in a direct harvest bean production system looking at both yield and harvest loss. Traditionally dry beans are harvested in a three step process starting with cutting, then windrowing and finally combining. Direct harvest is simply one pass through the field with the combine. A good upright bean variety, proper level field conditions and a combine header suitable for direct harvest are essential to minimize harvest loss and economically justify direct harvest.

This study evaluated four Pinto bean varieties all suitable for direct harvest. The varieties; Sinaloa, 06206 (Torreon), LaPaz and Monterrey were replicated four times in plots 500 ft by 30 ft. The plots were planted in a randomized complete block design on June 15 with a Case IH 5400 Soybean Drill. Stand counts were taken on June 29 when beans were approximately 3 inches tall. The plots were all fertilized, sprinkler irrigated and treated identically. Roundup and Sharpen were applied Sept. 9 as a pre harvest desiccant. Pod height measurements to determine the percent of pods above 2 inches were taken on Sept 14. Low hanging pods are a major cause of harvest loss in the direct harvest process.

The plots were harvested on Sept. 17 using a Case 7088 combine equipped with a MacDon FD70, 30 ft flex draper head. The center 30 feet of the 40 foot plot was harvested. The harvested plot area was 0.344 acres per treatment per rep. The beans from each plot were weighed using a Par-Kan weigh wagon with a Weigh-Tronix scale. Six square foot counts along the plot area were taken the day of harvest to estimate harvest loss during combining. A sample of beans was taken from each plot and analyzed for quality by Kelley Bean Company in Scottsbluff. All bean samples graded USDA #1, and the moistures were between 11.2 and 12.9%. The dry beans direct harvested in the surrounding field were Pinto variety Sinaloa with an average yield of 41 bu/ac.

Results:

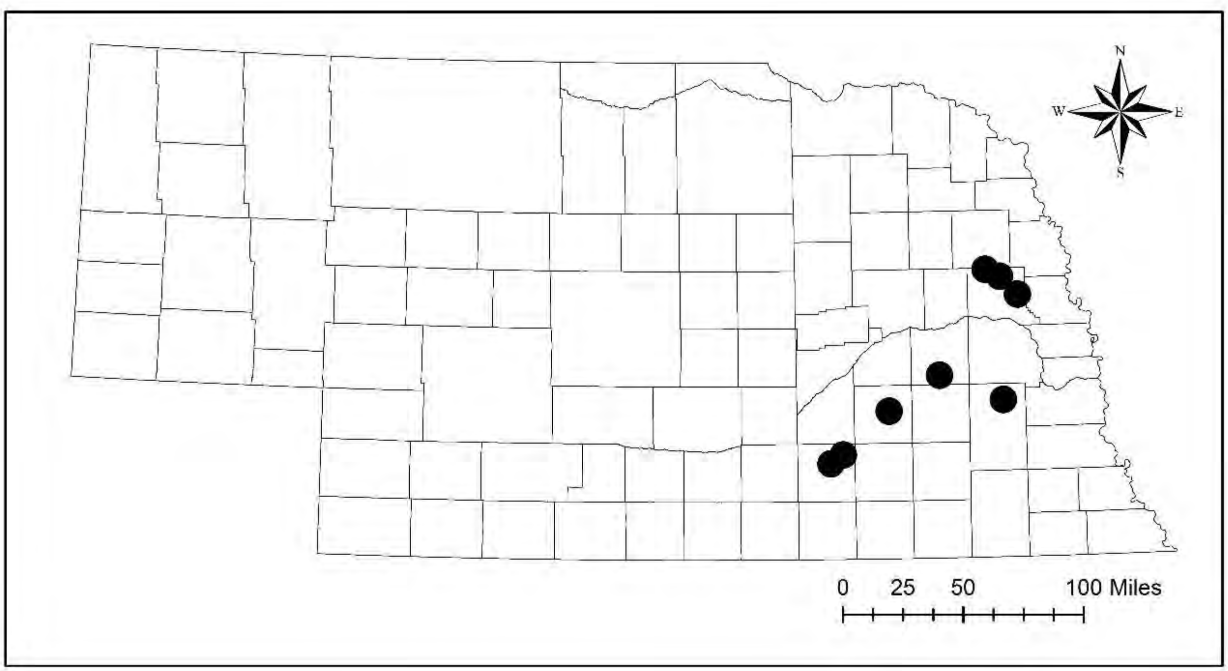
	Early Season Stand Count	Pod Height (% pods > 2")	Yield† (bu/ac)	Seeds per lb	Weight (#/bu)	Harvest Loss (bu/ac)	Marginal Net Return‡ ($/ac)
Monterrey	116,022 A*	93 AB	42 A	1,533 A	61 B	2.3 A	$504
LaPaz	109,923 AB	95 A	42 A	1,508 AB	61 B	2.6 A	$504
06206	95,983 C	93 AB	44 A	1,428 B	62 A	2.4 A	$528
Sinaloa	102,517 BC	92 B	41 A	1,508 AB	62 A	2.6 A	$492
P-Value	0.0004	0.0893	0.3726	0.0432	0.0066	0.5786	N/A

†Bushels per acre corrected to 14% standard moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Marginal net return based on $20/cwt ($12/bu at 60 lb/bu). There was no difference in seed cost for the varieties tested.

Summary: There were no significant yield differences between treatments with yields ranging from 41.3 to 44.4 bu/ac. These are good but not exceptional yields for Western Nebraska. With beans yielding in this range, pinto beans would have to be selling for around $26.00/ cwt to break even. Pinto beans were selling at $20 per cwt at harvest. There was not a significant difference in harvest loss which ranged from 2.3 to 2.6 bu/ac. These harvest losses are well within the acceptable range of 2 to 4 bu/ac. Differences in pod height above the soil existed but were not significantly reflected in yield loss. 90% of pods were more than 2 inches above the soil surface for all treatments. Good pod height is very important in minimizing direct harvest loss.

CROP PROTECTION

- Procidic® on Corn
- Xanthion™ Fungicide on Corn
- Priaxor® Fungicide In-Furrow on Soybeans
- Steward®, Prevathon®, and Steward® + Stratego YLD + Sugar on Soybeans
- Evaluating the Yield Response of Insect Control Traits in Rainfed Corn: VT2 vs VT3 Hybrid
- ILeVO® Seed Treatment for Sudden Death Syndrome – 3 studies



Procidic® on Corn

This study was conducted by the Kornhusker Kids 4-H Club as part of the Innovative Youth Corn Challenge.

Study ID: 103053201501
County: Dodge
Soil Type: Unknown
Planting Date: 5/19/15
Harvest Date: 10/24/15
Population: 32,000
Row Spacing (in.) 30
Hybrid: Fontanelle 09D623
Reps: 5
Previous Crop: Soybean
Tillage: No-Till

Herbicides: ***Pre:*** 5.6 oz/ac Corvus, 1 qt/ac Atrazine, and 24 oz/ac PowerMax ***Post:*** unknown
Seed Treatment: Unknown
Foliar Insecticides: Unknown
Foliar Fungicides: Unknown
Fertilizer: 100 lb/ac 11-52-00 preplant;
4 gal/ac starter at planting;
120 lb N/Ac 32-0-0 at sidedress
Note: Planted 12 row treatments, harvested 4 rows at center of each treatment to determine yields.
Irrigation: None

Introduction: Procidic® is used as a broad spectrum bactericide and fungicide (product ingredient table at right). The objective was to evaluate Procidic® to determine if it would have any impact on potential outbreaks of Goss's Bacterial Wilt and other disease. The field did not have a history of Goss's Bacterial Wilt and no symptoms were seen this year.

ACTIVE INGREDIENTS:
Citric acid 3.5%
OTHER INGREDIENTS:...... 96.5%
TOTAL.................................. 100%

Product information from:
http://www.greenspireglobal.com/pdf_docs/2012-Procidic-Row-Crop-Flyer.pdf

Three treatments were evaluated: Control, Procidic® applied in furrow at planting at 2 oz/ac, and Procidic® applied in furrow at planting at 2 oz/ac followed by another 2 oz/ac application prior to tasseling.

Results:

	Yield (bu/ac)†	Moisture (%)	Test Weight	Marginal Net Return ($/ac)‡
Check	228 A*	16.2 A	58 A	832.20
Procidic in Furrow (2 oz)	225 A	16.4 A	58 A	816.25
Procidic in Furrow (2 oz) and Foliar (2 oz)	227 A	16.3 A	58 A	818.55
P-Value	*0.5921*	*0.5718*	*0.2648*	*N/A*

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 15.5% moisture.
‡Net Return based on $3.65/bu corn and $2.50/oz. Procidic® cost. It is assumed both applications could be made with another operation, therefore an additional cost of application is not included.

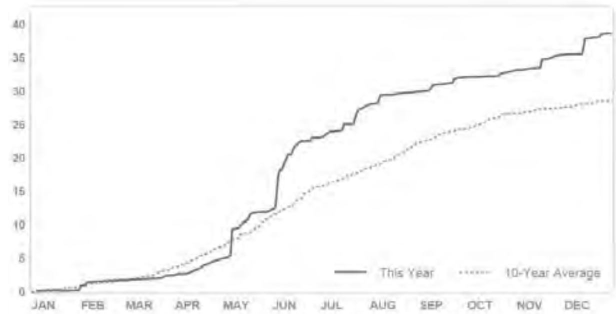
Summary: There were no differences in yield, test weight or moisture between the three treatments evaluated. The control treatment resulted in the highest net return.

"In summary we concluded that without the evidence of Goss's Wilt we did not see any advantage to using Procidic® . We were also hoping to see additional plant health benefits but with the yield results we did not see any economic advantage. Most importantly we learned that when trying a new practice or product it is a good practice to limit the exposure because we cannot control how it will affect the bottom line profit margin." - Kornhusker Kids 4-H

Xanthion™ Fungicide on Corn

Study ID: 032035201504
County: Clay
Soil Type: Hastings silt loam; Hastings silty clay loam;
Planting Date: 4/15/15
Harvest Date: 10/14/2015
Population: 33,000
Row Spacing (in.) 30
Hybrid: Mycogen 2Y767
Reps: 6
Previous Crop: Soybean
Tillage: Conventional Till
Herbicides: ***Pre:*** 1.5 qt/ac. Lexar ***Post:*** Unknown
Seed Treatment: Unknown
Insecticides: 6 oz/ac Capture LFR soil applied
Foliar Fungicides: 10.5 oz/ac Quilt Xcel

Fertilizer: 11-52-0, zone applied, fall application;
180 lb. actual N/ac, fall application;
30 lb. actual N/ac, spring application;
20 lb. actual N/ac, foliar, spring application.
Note: June 4, Hail, 35% damage
Irrigation: Pivot, Total: 5.0"
Rainfall (in.):



Introduction: Xanthion™ is an in-furrow fungicide (product ingredient information at right). The product was evaluted at planting with the starter fertilizer application. The check treatment was the grower's standard starter fertilizer - 3 gal 6-24-6 with 1 qt/acre micromax (2% Magnesium, 0.25% B, 2% Zn, 1.6% Fe, 0.5%Cu). To test the effect of Xanthion™ 1.2 fl oz Component A and 6.0 fl oz of Component B were added to the standard starter treatment.

Xanthion™

In-furrow fungicide

For soilborne/seedling disease control and plant health using in-furrow applications to corn (field and sweet)

Active Ingredient: (Component A)
Bacilius subtilis, strain MBI 600* 5.00%
Other Ingredients: 95.00%
Total: 100.00%
* Contains not less than 2.2×10^{10} viable spores per ml.

Active Ingredient*: (Component B)
pyraclostrobin: (carbamic acid, [2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl]methoxy-, methyl ester) 23.60%
Other Ingredients:** 76.40%
Total: 100.00%
* Equivalent to 2.09 pounds of pyraclostrobin per gallon
** Contains petroleum distillates

EPA Reg. No. 7969-368 **EPA Est. No.**

Product information from: *http://www.cdms.net/ldat/ldC3D006.pdf*

Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Stalk Rot (%)	Marginal Net Return ($/ac)‡
Starter (3 gal 6-24-6 + 1 qt Micromax)	230 A	16.0 A	30,800 A	9 A	839.50
Starter + Xanthion	233 A*	16.0 A	29,200 A	4 A	841.24
P-Value	*0.2359*	*0.892*	*0.4716*	*0.298*	*N/A*

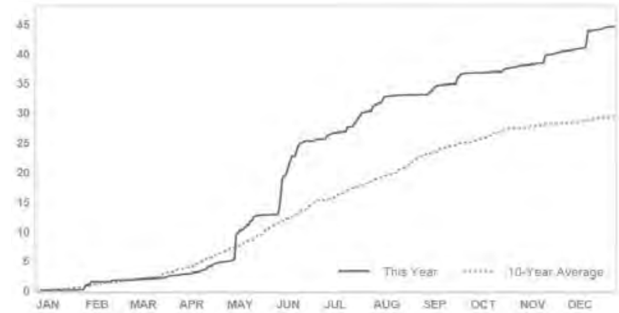
†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65/bu corn and $9.21/ac Xanthion™ treatment.

Summary: There was no yield, moisture, stand count, or stalk rot difference between the standard starter fertilizer treatment and the starter fertilizer plus Xanthion™

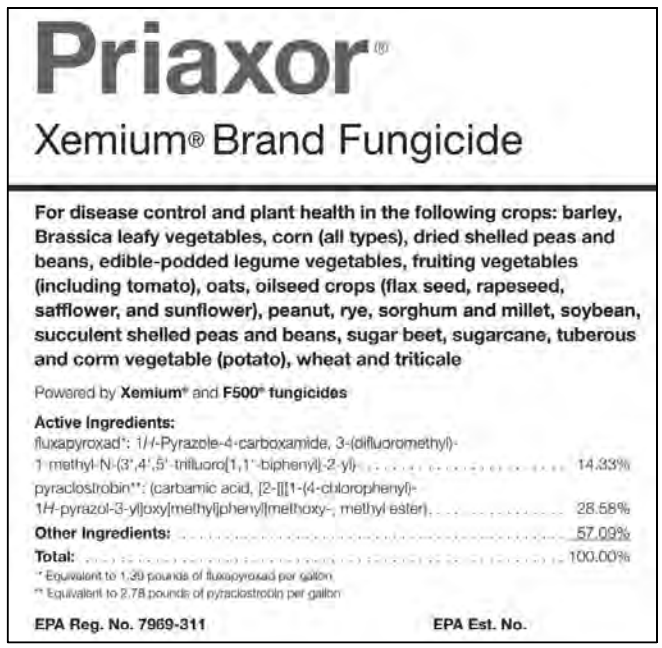
Priaxor® Fungicide In-Furrow on Soybeans

Study ID: 032035201502
County: Clay
Soil Type: Hastings silt loam; Crete silt loam; Hastings silty clay loam;
Planting Date: 5/1/15
Harvest Date: 9/17/15
Population: 155,000
Row Spacing (in.) 30
Hybrid: Asgrow 2431
Reps: 6
Previous Crop: Corn
Tillage: Conventional Till
Herbicides: ***Pre:*** 6.4 oz/ac Optil-Pro ***Post:*** 36 oz/ac Roundup
Seed Treatment: Acceleron and X-ite Bio Inoculant

Insecticides: 5 oz/ac Hero foliar applied at R3
Foliar Fungicides: 4 oz/ac Priaxor at R3
Fertilizer: 11-52-0 zone applied on 1/22/15.
Note: Hail, Sept. 8, 15% damage
Irrigation: Pivot, Total: 6.0"
Rainfall (in.):



Introduction: Priaxor® fungicide was applied in-furrow at a rate of 2 oz/ac. Prioxor® ingredient information is at right. This was compared to an untreated check. Later in the growing season around R3, a foliar application of 5 oz/ac Hero and 4 oz/ac Priaxor® was made to the entire field.



Priaxor®

Xemium® Brand Fungicide

For disease control and plant health in the following crops: barley, Brassica leafy vegetables, corn (all types), dried shelled peas and beans, edible-podded legume vegetables, fruiting vegetables (including tomato), oats, oilseed crops (flax seed, rapeseed, safflower, and sunflower), peanut, rye, sorghum and millet, soybean, succulent shelled peas and beans, sugar beet, sugarcane, tuberous and corm vegetable (potato), wheat and triticale

Powered by **Xemium®** and **F500® fungicides**

Active Ingredients:
fluxapyroxad*: 1*H*-Pyrazole-4-carboxamide, 3-(difluoromethyl)-1-methyl-N-(3',4',5'-trifluoro[1,1'-biphenyl]-2-yl) 14.33%
pyraclostrobin**: (carbamic acid, [2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl]methoxy-, methyl ester) 28.58%
Other Ingredients: 57.09%
Total: 100.00%
* Equivalent to 1.39 pounds of fluxapyroxad per gallon
** Equivalent to 2.78 pounds of pyraclostrobin per gallon

EPA Reg. No. 7969-311 **EPA Est. No.**

Product information from: *http://www.cdms.net/ldat/ldAK6003.pdf*

Results:

	Yield (bu/ac) †	Moisture (%)	Marginal Net Return ($/ac)‡
Check	88 A*	12.7 A	783.20
Priaxor Fungicide in Furrow (2 oz/ac)	87 A	12.7 A	766.66
P-Value	0.683	0.859	N/A

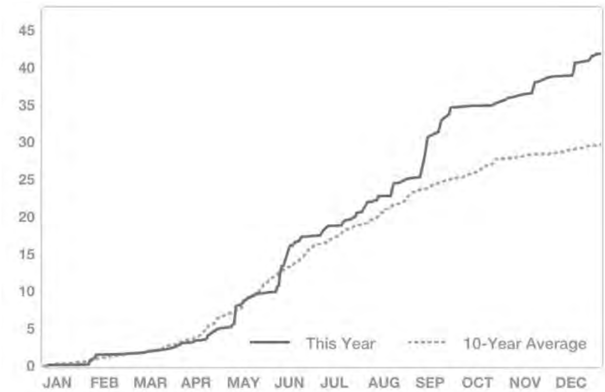
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $7.64/ac Priaxor treatment.

Summary: The application of 2 oz/ac Priaxor® in-furrow did not result in a yield increase or moisture difference when compared to the untreated check.

Steward®, Prevathon®, and Steward® + Stratego YLD + Sugar on Soybeans

Study ID: 026185201503
County: York
Soil Type: Hastings silt loam;
Planting Date: 5/22/15
Harvest Date: 9/29/15
Population: 140,000
Row Spacing (in.) 30
Hybrid: Pioneer 92Y70 & P24T19R
Reps:
Previous Crop: Soybean
Tillage: Ridge-Till
Herbicides: ***Pre:*** 22 oz/ac Roundup PowerMax and 2/3 pt/ac 2,4-D on 4/13/15;
5 oz/ac Authority First on 5/22/15 ***Post:*** 40 oz/ac Roundup PowerMax and 0.5 oz/ac Cadet on 6/17/15;
40 oz/ac Roundup PowerMax on 7/8/15

Fertilizer: None
Irrigation: Pivot, Total: 4.4"
Rainfall (in.):



Soil Test Results:

									Ammonium Acetate ----------ppm--------							% Base Saturation				
ID	Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	OM LOI-%	FIA Nitrate ppm N	10" Depth Nitrate Lbs N/A	M-P3 ppm P	K	Ca	Mg	Na	Ca-P Sulfate ppm S	DTPA Zn ppm	Sum of Cations me/100g	H	K	Ca	Mg	Na
SE Pivot																				
NE40	6.2	6.7	0.38	NONE	3.9	10.1	30	25	431	2260	378	45	12	3.38	18.4	14	6	62	17	1
NW40	6.3	6.8	0.32	NONE	3.4	10.2	31	16	482	2063	330	43	12	2.78	16.6	13	7	62	17	1
SW40	6.2	6.8	0.23	NONE	3.3	3.8	11	19	482	2107	362	44	12	1.81	17.2	13	7	61	18	1
SE40	6.5	6.8	0.31	NONE	3.4	9.6	29	38	557	2139	323	40	14	2.69	16.6	10	9	64	16	1
SW Pivot																				
NE40	6.1	6.6	0.27	NONE	3.2	9	27	18	458	2035	289	42	14	3.53	18.0	23	7	56	13	1
NW40	6.3	6.7	0.25	NONE	3.1	7.3	22	21	552	1995	284	44	14	3.15	17.2	19	8	58	14	1
SW40	6.2	6.7	0.26	NONE	4.0	9.1	27	36	492	1952	251	46	14	4.37	16.5	19	8	59	13	1
SE40	6	6.5	0.24	NONE	3.5	4.2	12	27	503	1683	220	40	16	3.19	16.7	30	8	50	11	1

Introduction: The objective of this study was to look at the impact of Prevathon® and Steward® on soybeans after soybeans for control of stem borer.

There were 4 treatments: (1) Steward® (product ingredients below), (2) Prevathon® (product ingredients below), (3) Steward®, Stratego YLD, Sugar, and (4) Check. Steward is labeled for several key soybean pests, but not currently labeled for dectes stem borer.

Prevathon® was applied on 7/4/15 at R1. Steward® was applied on 7/27/15 at R3. There were also 2 varieties used in the study area. This study was conducted on two adjoining pivots. The study was improperly randomized, so results should not be extended beyond this field location.

DuPont™ Prevathon®

Active Ingredient RynaXypyr®

Contains 0.43 lb. active ingredient per gallon.

Active Ingredient	*By Weight*
Chlorantraniliprole 3-Bromo-N-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide	5%
Other Ingredients	95%
TOTAL	100%

Product information from: *http://www.dupont.com/products-and-services/crop-protection/corn-protection/products/prevathon.html*

DuPont™ Steward® EC

Emulsifiable Concentrate

Contains 1.25 lbs. Active Ingredient per gallon.

Active Ingredient	*By Weight*
Indoxacarb (S)-methyl 7-chloro-2,5-dihydro-2-[[(methoxycarbonyl)[4-(trifluoromethoxy)phenyl]amino]carbonyl]indeno[1,2-e][1,3,4]oxadiazine-4a(3H)-carboxylate	15.84%
Other Ingredients	84.16%
TOTAL	100%

Product information from: *http://www.dupont.com/products-and-services/crop-protection/soybean-protection/products/steward-ec.html*

Results:

The treatments were evaluated at R5.5 for tunneling by splicing the main stem of 20 plants in a row at 6 locations for a total of 120 plants evaluated. These data were not collected in each replication so a statistical analysis could not be performed, however observations are reported.

Prevathon treatment: 9 tunneled plants out of 120

Steward treatment: 41 tunneled plants out of 120

Check: 35 tunneled plants out of 120

Yield data was analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was done with Fisher's LSD. There was no treatment by variety interaction. Results of the treatments, varieties, and pivots are shown below. Marginal net return was calculated for the treatments.

Pivot:	**Yield**	**Marginal Net Return‡ ($/ac)**
East Pivot	73 B*	-
West Pivot	79 A	-
P-Value	<0.0001	
Variety:		
24T19	75 A	-
92Y70	76 A	-
P-Value	0.2852	
Treatment:		
None	75 A	667.50
Prevathon®	76 A	648.40
Steward®	75 A	636.38
Steward + Stratego YLD +Sugar	77 A	638.37
P-Value	0.3560	

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans, $1.50/ac sugar, $14.31/ac Stratego YLD, $28/ac Prevathon, and $23/ac Steward. Prevathon was applied with RoundUp, so no application cost is accounted for; Steward was an extra trip at R2-R3, so an $8.12/ac application rate was accounted for.

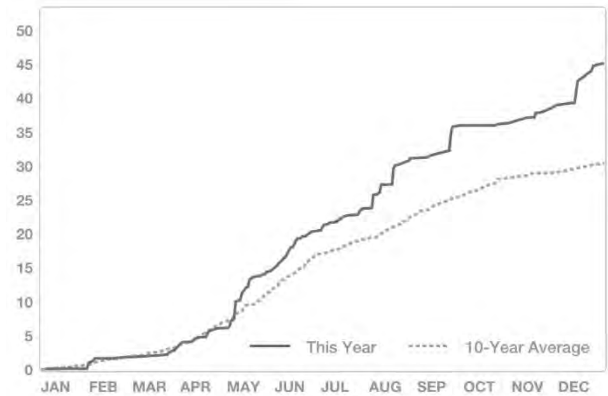
Summary: There was no yield difference between the 4 treatments in this study. There was also no yield difference between the 2 varieties used in this study. The 2 pivots had significantly different yields.

Evaluating the Yield Response of Insect Control Traits in Rainfed Corn: VT2 vs VT3 Hybrid

Study ID: 030109201501
County: Lancaster
Soil Type: Wymore silty clay loam; Yutan silty clay loam; Aksarben silty clay loam;
Planting Date: 4/29/15
Harvest Date: 11/5/15
Population: 30,000
Row Spacing (in.) 30
Hybrid: DKC 62-97 VT3 and DKC 62-98 VT2
Reps: 8
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 2.1 qt/acre Bicep ***Post:*** 1.8 oz/acre Callisto and 1 qt/acre Roundup
Seed Treatment: unknown
Foliar Insecticides: None
Foliar Fungicides: None

Fertilizer: 160 lbs/ac actual N as anhydrous ammonia, fall 2014

Irrigation: None
Rainfall (in.):



Introduction: Corn hybrids today can be purchased with and without pest management traits. The purpose of this study was to evaluate the performance of two hybrids genetically the same except for the addition of the corn rootworm trait. This field is in a corn/soybean rotation. This is a continuation of a similar effort in previous years.

Results:

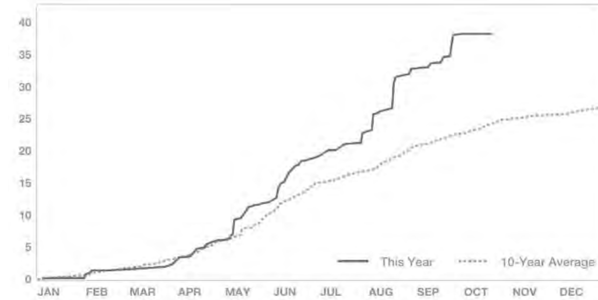
	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
VT2	203 B*	14.7 A	$740.95
VT3	206 A	14.7 A	$745.51
P-Value	0.0296	0.4512	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn and $6.39/acre marginal additional cost for VT3 trait over VT2.

Summary: There was no grain moisture difference between the VT2 and VT3 hybrids. Yield was higher for the VT3 hybrid. The additional 3 bu/ac for the VT3 hybrid was enough to cover the marginal additional cost of the VT3 trait. These results are different than results of this study in 2014. The two Lancaster county sites in 2014 had no yield increase for using the VT3 hybrid in a corn/soybean rotation.

ILeVO® Seed Treatment for Sudden Death Syndrome

Study ID: 173023201501
County: Butler
Soil Type: Hastings silt loam;
Planting Date: 5/29/15
Harvest Date: 10/2/15
Population: 160,000
Row Spacing (in.) 30
Hybrid: AG2733 RR
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** Authority First, 2-4D and Roundup ***Post:*** Roundup and Flexstar
Seed Treatment: None, other than those being studied.
Foliar Insecticides: none
Foliar Fungicides: none
Fertilizer: none
Note: There were cattle on the field prior to season.
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Soil Sample Results:

ID	Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	FIA Nitrate ppm N	Nitrate Lbs N/A for 0-8 in.	M-P3 ppm P	----Ammonium Acetate--- -------------ppm-------------				Sum of Cations me/100g	% Base Saturation				
								K	Ca	Mg	Na		H	K	Ca	Mg	Na
Rep 1	6.2	6.7	0.28	NONE	16.8	40	8	373	2383	308	16	18.7	17	5	64	14	0
Rep 2	6.2	6.8	0.27	NONE	13.7	33	10	351	2221	280	16	16.7	14	5	66	14	0
Rep 3	6.2	6.7	0.24	NONE	13.0	31	8	364	2269	279	16	17.7	17	5	64	13	0
Rep 4	6.1	6.8	0.25	NONE	12.5	30	7	384	2387	287	17	17.1	10	6	70	14	0

Introduction: Sudden Death Syndrome (SDS) is caused by the soil borne fungus Fusarium solani f. sp. glycines. While this is a relatively new disease for Nebraska soybean farmers, there are several locations in the state where significant percentages of fields are being affected. In field where SDS is present and soybean cyst nematode is also present the disease can be more severe. There are not clear guidelines to determine at what point a field will have enough increase in yield to justify treatment and therefore, on-farm research projects like this one are needed.

GROUP 7 FUNGICIDE

A systemic seed treatment for use on soybean for the protection against damage caused by early season plant pathogenic nematodes. As a soybean seed treatment provides protection from seedling infections by *Fusarium virguliforme*, the causal agent of Sudden Death Syndrome.

ACTIVE INGREDIENT:
FLUOPYRAM: *N*-[2-[3-chloro-5-(trifluoromethyl)-2-pyridinyl]ethyl]-2-(trifluoromethyl)benzamide* 48.4%
OTHER INGREDIENTS: 51.6%
Contains 5 lbs FLUOPYRAM per gallon (600 g FLUOPYRAM per liter) **TOTAL:** 100.0%
*(CAS Number 658066-35-4)

EPA Reg. No. 264-1157

Product information from: *http://www.agrian.com/pdfs/ILeVO_Label1.pdf*

ILeVO® is a seed treatment marketed by Bayer Crop Science for SDS and also has nematode activity. This field was selected due to the presence of SDS in the 2013 soybean crop. Three treatments were selected to test the efficacy of the ILeVO seed treatment.

A: Untreated check

B: Standard soybean treatment (for this study Eclipse was used; Eclipse is Fludioxonil 0.08, Thiabendazole 0.08, Metalaxyl 0.55, Imidaloprid 5# 1.6)

C: Standard soybean treatment plus ILeVO® at a rate of 1.18 fl oz/140,000 seed unit

Phosphorus samples (above) were taken because low phosphorus has been linked to higher severity of SDS. Soybean cyst nematode (SCN) samples were also taken early in the growing season in each treatment and rep because of the relationship between SDS and SCN. Any variation in SCN population density was not due to treatment as this was prior to any effect. The variation observed is typical of the variation in population density observed when a field is randomly sampled. This information is intended to provide an base population level for the trial.

	Soybean Cyst Nematode (SCN) (# eggs/100 cc soil)
Check - Untreated Seed	60 A
Seed Treatment - Eclipse	570 A
Seed Treatment - Eclipse + ILeVO	110 A
P-Value	0.122

Foliar disease symptoms were assessed using Southern Illinois University at Carbondale's Method of SDS scoring. The disease symptoms were assessed using a 1 to 9 scoring system, with a score of 1 indicating the least symptoms and 9 indicating premature death. In addition, the overall incidence of affected plants was determined. These two scores were combined to create the disease index (DX). DX = disease incidence x disease severity/9. Disease assessments were conducted on 8/21/15 and 9/2/15.

Results:

	Disease Severity	Disease Incidence (%)	Disease Index (DX)	Disease Severity	Disease Incidence (%)	Disease Index (DX)
	----------Aug 21, 2015---------			---------Sept. 2, 2015---------		
Check - Untreated Seed	1.50 A	31.1 A	5 A	2.29 A	17.5 A	5 A
Seed Treatment - Eclipse	1.33 A	10.8 B	2 B	2.04 AB	13.3 AB	3 AB
Seed Treatment - Eclipse + ILeVO	1.37 A	14.5 B	2 B	1.62 B	5.7 B	1 B
P-Value	0.8634	0.000	0.0084	0.0731	0.0689	0.1036

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac) ‡
Check - Untreated Seed	59 B*	11.3 B	132,417 B	$525.10
Seed Treatment - Eclipse	60 B	11.3 B	139,250 A	$524.25
Seed Treatment - Eclipse + ILeVO®	62 A	12.4 A	134,583 B	$528.05
P-Value	0.0068	0.0041	0.0118	N/A

†Bushels per acre corrected to 13% moisture.

*Values with the same letter are not significantly different at a 90% confidence level.

‡Net Return based on $8.90/bu soybeans, $9.75/acre Eclipse treatment cost and $23.75/acre Eclipse and ILeVO® treatment cost.

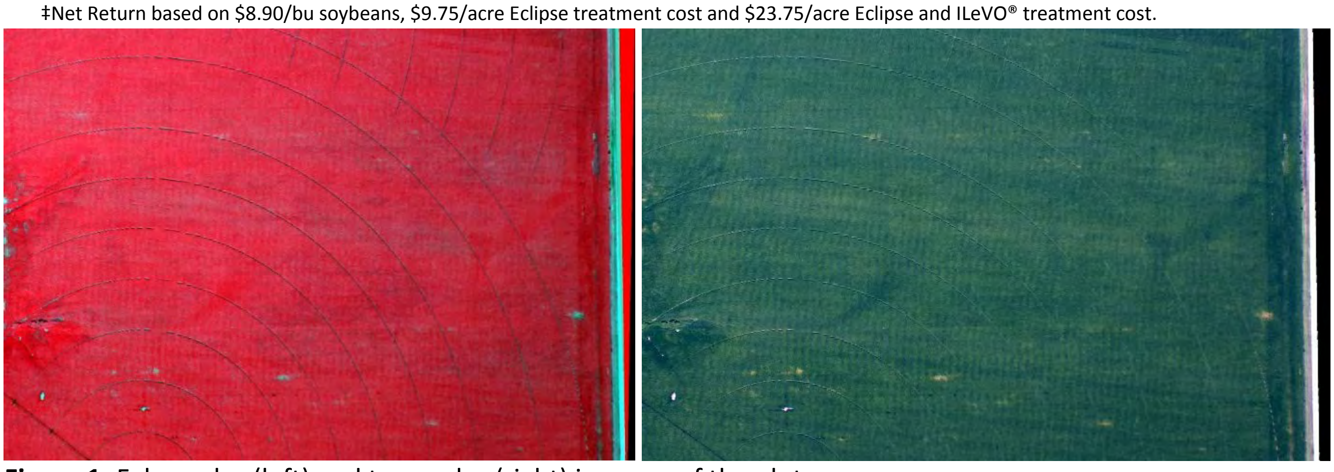


Figure 1: False-color (left) and true-color (right) imagery of the plot area.

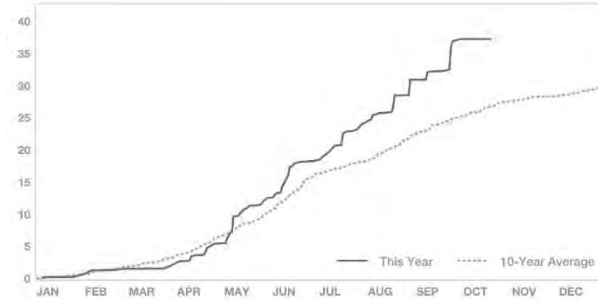
Summary: On the first date of disease ratings, the untreated check had a higher disease incidence than the standard treatment and standard + ILeVO® treatment. There was no difference in severity. At the second date, the untreated check had a higher disease incidence and severity than the standard + ILeVO® treated seed. The standard seed treatment had a higher harvest stand count than the untreated and standard + ILeVO® treatment. At harvest, the standard + ILeVO® treated seed had a higher moisture than the standard treated seed and untreated seed. There was no yield difference between the standard and untreated seed. The standard + ILeVO® treated seed had higher grain yields than the standard and untreated seed.

This study sponsored in part by: Bayer CropScience LP

ILeVO® Seed Treatment for Sudden Death Syndrome

Study ID: 171053201501
County: Dodge
Soil Type: Alcester silty clay loam; Coleridge silty clay loam;
Planting Date: 5/21/2015
Harvest Date: 10/6/15
Population: 150,000
Row Spacing (in.) 30
Hybrid: Hoegemeyer 2860
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** 6 oz/ac of Sonic (cloransulam-methyl & sulfentrazone) and 1/2 pt 2,4-D on 4/15/15. ***Post:*** 24 oz/ac Roundup Powermax (glyphosate) and 5 oz/ac of Arrow (clethodim) on 6/20/15.
Seed Treatment: None other than the treatments

Foliar Insecticides: Aerial sprayed for soybean aphids, 8 oz/ac of Nufos-4-E (Chlorpyrifos) and 3 oz/ac of Lamba-CY 1EC (Lambda-cyhalothrin) on 8/15/15.
Foliar Fungicides: None
Fertilizer: 50 lbs of MAP/acre
Note: Hail storm on July 31 and soybeans lodged significantly.
Irrigation: Pivot, Total: 0"
Rainfall (in.):

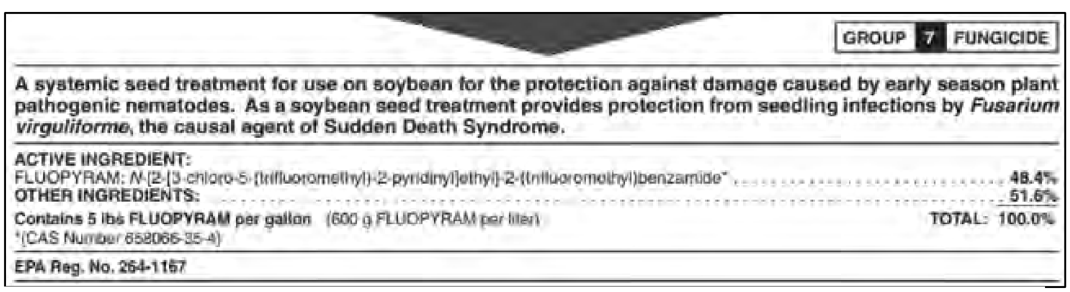


Soil Sample Results:

ID	Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	FIA Nitrate ppm N	Nitrate Lbs N/A for 0-8 in.	M-P3 ppm P	----Ammonium Acetate--- -------------ppm------------- K	Ca	Mg	Na	Sum of Cations me/100g	% Base Saturation H	K	Ca	Mg	Na
Rep 1	6.3	6.7	0.33	NONE	22.8	55	57	232	2945	300	12	20.8	14	3	71	12	0
Rep 2	6.3	6.8	0.36	NONE	17.3	42	71	266	3168	341	12	21.2	8	3	75	13	0
Rep 3	6.4	6.8	0.32	NONE	15.4	37	60	229	2796	326	10	19.5	11	3	72	14	0
Rep 4	6.2	6.9	0.31	NONE	16.3	39	59	187	2450	294	9	16.4	7	3	75	15	0

Introduction: Sudden Death Syndrome (SDS) is caused by the soil borne fungus Fusarium solani f. sp. glycines . While this is a relatively new disease for Nebraska soybean farmers, there are several locations in the state where significant percentages of fields are being affected. In field where SDS is present and soybean cyst nematode is also present the disease can be more severe. There are not clear guidelines to determine at what point a field will have enough increase in yield to justify treatment and therefore, on-farm research projects like this one are needed.

ILeVO® is a seed treatment marketed by Bayer Crop Science for SDS and also has nematode activity (label at right). This field was selected due to the presence of SDS in the 2013 soybean crop. Three treatments were selected to test the efficacy of the ILeVO® seed treatment.


GROUP 7 FUNGICIDE

A systemic seed treatment for use on soybean for the protection against damage caused by early season plant pathogenic nematodes. As a soybean seed treatment provides protection from seedling infections by *Fusarium virguliforme*, the causal agent of Sudden Death Syndrome.

ACTIVE INGREDIENT:
FLUOPYRAM: *N*-[2-[3-chloro-5-(trifluoromethyl)-2-pyridinyl]ethyl]-2-(trifluoromethyl)benzamide* 48.4%
OTHER INGREDIENTS: 51.6%
Contains 5 lbs FLUOPYRAM per gallon (600 g FLUOPYRAM per liter) **TOTAL: 100.0%**
*(CAS Number 658066-35-4)

EPA Reg. No. 264-1157

Product information from: *http://www.agrian.com/pdfs/ILeVO_Label1.pdf*

A: Untreated check

B: Standard soybean treatment (for this study Acceleron + Poncho/VOTiVO were used)

C: Standard soybean treatment plus ILeVO® at a rate of 1.18 fl oz/140,000 seed unit

Phosphorus samples (above) were taken because low phosphorus has been linked to higher severity of SDS. Soybean cyst nematode (SCN) samples were also taken early in the growing season in each treatment and rep because of the relationship between SDS and SCN. Any variation in SCN population density was not due to treatment as this was prior to any effect. The variation observed is typical of the variation in population density observed when a field is randomly sampled. This information is intended to provide an base population level for the trial.

	Soybean Cyst Nematode (SCN) - (# eggs/100 cc soil)
Check - Untreated Seed	60 A
Acceleron + Poncho/VOTiVO + Seed Coating	30 A
Acceleron + Poncho/VOTiVO + ILeVO + Seed Coating	10 A
P-Value	.5596

Foliar disease symptoms were also assessed using Southern Illinois University at Carbondale's Method of SDS scoring. The disease symptoms were assessed using a 1 to 9 scoring system, with a score of 1 indicating the least symptoms and 9 indicating premature death. In addition, the overall incidence of affected plants was determined. These two scores were combined to create the disease index (DX). DX = disease incidence x disease severity/9. Disease assessments were conducted on n 8/20/15 and 9/1/15.

Results:

	Disease Severity	Disease Incidence (%)	Disease Index (DX)	Disease Severity	Disease Incidence (%)	Disease Index (DX)
	----------Aug. 20, 2015----------			----------Sept. 1, 2015----------		
Check - Untreated Seed	0.95 A	1.6 A	0 A	1.20 A	3.7 A	1 A
Acceleron + Poncho/VOTiVO	1.45 A	2.2 A	0 A	1.45 A	5.0 A	1 A
Acceleron + Poncho/VOTiVO + ILeVO®	0.95 A	1.3 A	0 A	1.00 A	2.7 A	0 A
P-Value	.3866	.7773	.8299	.4487	.5176	.4565

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac)‡
Check - Untreated Seed	62 A*	12.0 A	139,583 A	$551.80
Acceleron + Poncho/VOTiVO	60 A	12.0 A	131,583 B	$522.00
Acceleron + Poncho/VOTiVO + ILeVO®	60 A	12.0 A	134,917 AB	$508.00
P-Value	.2869	0.8477	.1039	N/A

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans, $12.00/ac Poncho/VOTiVO treatment cost and $26.00/ac Poncho/VOTiVO and ILeVO® treatment cost.

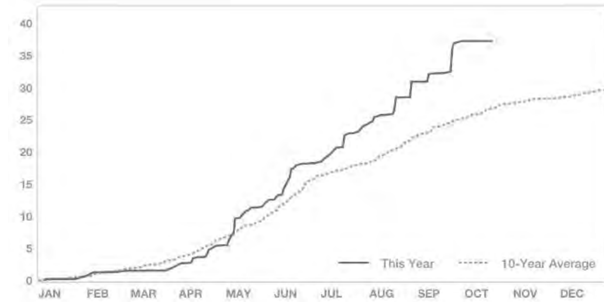
Summary: On the first and second date of disease ratings, there was no difference in disease incidence, severity, or index among the three treatments. At harvest, there was no moisture or yield difference among the three treatments. The untreated seed resulted in the highest marginal net return.

Figure 1: False-color (left) and true-color (right) imagery of the plot area.

This study sponsored in part by: Bayer CropScience LP

ILeVO® Seed Treatment for Sudden Death Syndrome

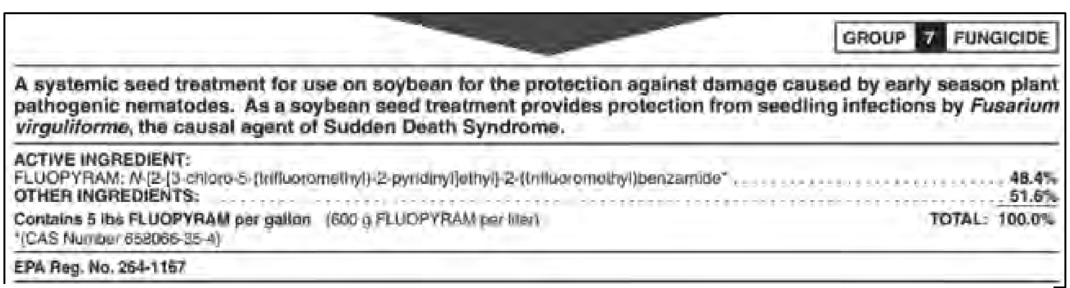
Study ID: 048053201501
County: Dodge
Soil Type: Moody silty clay loam;
Planting Date: 5/21/2015
Harvest Date: 10/6/15
Population: 152,000
Row Spacing (in.) 30
Hybrid: Asgrow 2834
Reps: 4
Previous Crop: Corn
Tillage: Fall Disk and Spring Field Cultivation
Herbicides: ***Pre:*** 3 oz/ac Valor, 1/3 lbs/ac Metribuzen, and Aim on 5/23/15. ***Post:*** 24 oz/ac Powermax and 1.5 qt/ac Warrant on 6/15/15.
Seed Treatment: None other than those being studied.
Foliar Insecticides: None
Foliar Fungicides: Aerial application of Priaxor (4 oz/ac) and Insecticide on 8/1/15.
Fertilizer: None
Irrigation: Pivot, Total: 0.75"
Rainfall (in.):



Soil Sample Results:

ID	Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	FIA Nitrate ppm N	Nitrate Lbs N/A for 0-8 in.	M-P3 ppm P	----Ammonium Acetate--- --------------ppm------------- K	Ca	Mg	Na	Sum of Cations me/100g	% Base Saturation H	K	Ca	Mg	Na
Rep 1	6.8		0.27	NONE	9.2	22	45	365	2698	310	13	17.1	0	5	79	15	0
Rep 2	6.4	6.9	0.26	NONE	11.4	27	54	385	2615	314	16	18.1	7	5	72	15	0
Rep 3	6.9		0.28	NONE	14.3	34	59	379	2799	323	19	17.7	0	5	79	15	0
Rep 4	6.7		0.31	NONE	12.4	30	54	376	2851	346	18	18.2	0	5	78	16	0

Introduction: Sudden Death Syndrome (SDS) is caused by the soil borne fungus Fusarium solani f. sp. glycines . While this is a relatively new disease for Nebraska soybean farmers, there are several locations in the state where significant percentages of fields are being affected. In field where SDS is present and soybean cyst nematode is also present the disease can be more severe. There are not clear guidelines to determine at what point a field will have enough increase in yield to justify treatment and therefore, on-farm research projects like this one are needed.


GROUP 7 FUNGICIDE

A systemic seed treatment for use on soybean for the protection against damage caused by early season plant pathogenic nematodes. As a soybean seed treatment provides protection from seedling infections by *Fusarium virguliforme*, the causal agent of Sudden Death Syndrome.

ACTIVE INGREDIENT:
FLUOPYRAM: N-[2-[3-chloro-5-(trifluoromethyl)-2-pyridinyl]ethyl]-2-(trifluoromethyl)benzamide* 48.4%
OTHER INGREDIENTS: 51.6%
Contains 5 lbs FLUOPYRAM per gallon (600 g FLUOPYRAM per liter) **TOTAL: 100.0%**
*(CAS Number 658066-35-4)

EPA Reg. No. 264-1157

Product information from: *http://www.agrian.com/pdfs/ILeVO_Label1.pdf*

ILeVO® is a seed treatment marketed by Bayer Crop Science for SDS and also has nematode activity (label at right). This field was selected due to the presence of SDS in the 2013 soybean crop. Three treatments were selected to test the efficacy of the ILeVO seed treatment.

A: Untreated check

B: Standard soybean treatment (for this study Acceleron + Poncho/VOTiVO were used)

C: Standard soybean treatment plus ILeVO® at a rate of 1.18 fl oz/140,000 seed unit

Phosphorus samples (above) were taken because low phosphorus has been linked to higher severity of SDS. Soybean cyst nematode (SCN) samples were also taken early in the growing season in each treatment and rep because of the relationship between SDS and SCN. Any variation in SCN population density was not due to treatment as this was prior to any effect. The variation observed is typical of the variation in population density observed when a field is randomly sampled. This information is intended to provide an base population level for the trial.

	Soybean Cyst Nematode (SCN) - (# eggs/100 cc soil)
Check - Untreated Seed	720 A
Acceleron + Poncho/VOTiVO + Seed Coating	830 A
Acceleron + Poncho/VOTiVO + ILeVO® + Seed Coating	1,800 A
P-Value	0.4082

Foliar disease symptoms were also assessed using Southern Illinois University at Carbondale's Method of SDS scoring. The disease symptoms were assessed using a 1 to 9 scoring system, with a score of 1 indicating the least symptoms and 9 indicating premature death. In addition, the overall incidence of affected plants was determined. These two scores were combined to create the disease index (DX). DX = disease incidence x disease severity/9. Disease assessments were conducted on n 8/20/15 and 9/1/15.

Results:

	Disease Severity	Disease Incidence (%)	Disease Index (DX)	Disease Severity	Disease Incidence (%)	Disease Index (DX)
	----------Aug. 20, 2015----------			--------- Sept. 1, 2015—-------		
Check - Untreated Seed	2.41 A	10.8 AB	3 AB	2.29 A	15.4 AB	4 A
Acceleron + Poncho/VOTiVO	2.62 A	14.5 A	4 A	2.20 A	18.8 A	5 A
Acceleron + Poncho/VOTiVO + ILeVO®	1.91 A	7.9 B	2 B	1.75 B	10.8 B	2 B
P-Value	0.1451	0.015	0.026	0.0079	0.0156	0.0142

	Yield (bu/ac)†	Moisture (%)	Test Weight	Harvest Stand Count	Marginal Net Return ($/ac)‡
Check - Untreated Seed	60 B*	11.8 A	56 A	134,500 A	$534.00
Acceleron + Poncho/VOTiVO	57 B	11.5 A	55 B	136,500 A	$495.30
Acceleron + Poncho/VOTiVO + ILeVO®	64 A	11.5 A	56 A	136,500 A	$543.60
P-Value	0.0114	0.237	0.0085	0.8116	N/A

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans, $12.00/ac Poncho/VOTiVO treatment cost, and $26.00/ac Poncho/VOTiVO and ILeVO® treatment cost.

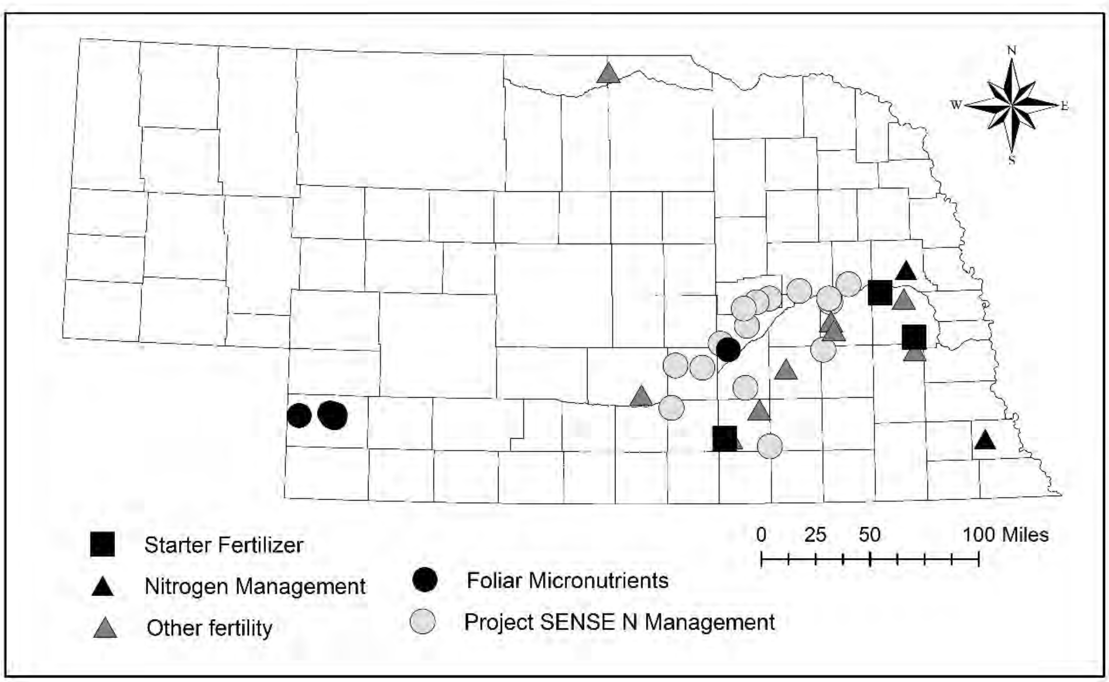
Figure 1: False-color (left) and true-color (right) imagery of the plot area.

Summary: On the first date of disease ratings, the standard treatment had a higher disease incidence than the standard + ILeVO® treatment. There was no difference in severity. At the second date, the standard treatment again had a higher disease incidence than the standard + ILeVO® treatment. The standard + ILeVO® treatment had a lower disease severity than the untreated or standard treatment. There were no differences in harvest stand counts. At harvest, there was no moisture difference among the three treatments. There was no yield difference between the standard and untreated seed. The standard + ILeVO treated seed had higher grain yields than the standard and untreated seed.

This study sponsored in part by: Bayer CropScience LP

PLANT NUTRITION

- Foliar Micronutrients – 8 locations
- Project SENSE N Management – 15 locations
- Other Nitrogen Management
    - Maize-N Nitrogen Sidedress Rate
    - Nitrogen Sidedress to Simulate Aerial N Application
- Starter Fertilizer
    - Starter Fertilizer on Rainfed Corn
    - Nachurs® Starter Fertilizer on Soybeans
    - Aurora Bean Starter™ Application on Soybeans
- Other Fertility Studies
    - AnnGro Additive with UAN through Pivot – 2 locations
    - Accomplish® LM on Soybeans
    - Manganese on Soybean
    - Strip-till Fertilizer Placement in Soybeans
    - Fulvic Acid In-Furrow on Soybeans
    - Metalosate Big 5 on Soybeans
    - Commence® Seed Treatment on Soybeans – 2 locations



Where Do Foliar Micronutrient Applications Fit in Corn Production?

Reproduced from the 2016 Crop Production Clinic Proceedings.

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Introduction to Plant Analysis

Plant tissue analysis is a diagnostic technique commonly used to track the nutrient status of plants during the growing season. It is widely used in combination with soil sampling to provide a basis for prescribing lime and fertilizer needs. The two most common objectives of plant tissue analysis are to monitor the nutrient status of crops during the growing season or to verify deficiency symptoms. This analysis helps to determine if soil fertility levels and applied fertilizers are sufficient to meet crop nutritional needs.

Micronutrients are essential to corn growth but are only needed in very small concentrations (*Table 1*). Thus, plant tissue analysis is an excellent tool for assessing the micronutrient status of corn throughout the growing season. This technique has been used for years but recently gained attention because with increasing yields there appears to be temporal shortages of micronutrients during the growing season. Commercially, there are now many micronutrient products available to remedy this problem and ensure quality grain yields.

Table 1. Estimates of micronutrient uptake by crops

Micronutrient	*200 Bu Corn*	*60 Bu Soybean*	*6 Ton Alfalfa*
	lb/acre	*lb/acre*	*lb/acre*
Iron	2.4	1.7	1.8
Manganese	0.4	0.6	0.6
Zinc	0.4	0.2	0.2
Boron	0.2	0.1	0.3
Copper	0.1	0.1	0.06
Molybdenum	0.01	0.01	0.02

Adapted from: *Role of Micronutrients in Efficient Crop Production*, D.B. Mengel, Purdue University AY-239.

The concept of plant analysis is built on Julius von Liebig and Carl Sprengel's "Law of the Minimum" in that plants grow to the limit imposed by the nutrient in least supply. Deficiency of any one of the essential plant nutrients can limit plant growth. Plant tissue analysis makes use of this foundational concept by comparing the elemental concentration of a particular plant part with established critical values or sufficiency ranges of the same plant species. This comparison of the elemental concentration of the sampled plant and established critical values or sufficiency ranges is the basis for accessing the plant's nutrient status (*Table 2*). Generally, a plant sample with a nutrient concentration below the sufficiency range or critical value implies a deficiency of that nutrient indicating that the nutrient is either limiting or unavailable. As illustrated in table 2, there is a range of specific critical levels that is rather broad, indicating that other factors such as growth stage at sampling, genetic, soil, cultural, and environmental factors have an influence on plant nutrient concentrations. These must be taken into consideration when interpreting plant analysis.

Table 2. Published critical micronutrient concentrations and sufficiency ranges in corn (adapted from Escano et al. 1981)

Study	Growth Stage	Mn	Fe	Cu	Zn	B	Mo
		ppm					
1	Plants <12" tall	20-300†	50-250†	5-20†	20-60†	5-25†	0.10-10.00†
1	Prior to tasseling	15-300†	10-200†	3-15†	15-60†	4-25†	0.10-0.30†
1	Initial Silk	20-200†	20-250†	6-20†	25-100†	5-25†	0.10-0.20†
2	Initial Silk	15‡	15‡	5‡	15‡	-	-
3	Initial Silk	34-200†	21-250†	8-20†	50-150†	-	-
4	Initial Silk	20-150†	21-250†	6-20†	20-70†	-	-
5	Initial Silk	-	-	-	15‡	-	-
6	Initial Silk	-	-	-	15‡	-	-
7	Initial Silk	-	-	-	17‡	-	-
Mean Initial Silk§		15‡	15‡	5‡	15‡	-	-
Mean Initial Silk¶		24.7-183†	20.7-250†	6.7-20†	32-106†	5-25†	0.10-0.20†

† Sufficiency Range
‡ Critical Value
§ Average corn nutrient concentration critical value from the above published studies at the initial silk growth stage
¶ Average corn nutrient concentration sufficiency range from the above published studies at the initial silk growth stage

Plant tissue analysis is performed in three basic steps: (1) sampling and sample preparation, (2) laboratory analysis, and (3) interpretation of results to provide a supplementation recommendation. However, the first step involves determining when to sample. This will depend on whether the farmer is trying to catch a deficiency before it is yield-limiting one or if a deficiency has been identified. If the farmer is anticipating problems sampling will occur at an early age. However, when the plant is young there are other factors that might cause an early low reading and a false low reading would be costly since application would not be needed. Additional challenges include having enough representative tissue to sample and having enough leaf area for good contact between the micronutrient spray and the leaves. Most broadcast spray will not be intercepted by small corn plants and will be soil applied. Most of the data in table 2 is for corn at silking. At this stage it might be too late to influence yield.

There are many other factors affecting plant tissue nutrient concentrations such as genetics, disease, insect, and weed pressure, climate (light, temperature, rainfall, humidity), and soil properties (pH, soluble salts, moisture, temperature.) Any one or combination of these factors may reduce the plant tissue concentration even when there is adequate levels of that nutrient in the soil. The plant part sampled is important to a good interpretation of the results. When corn is less than 12in. tall, collect all of the above ground foliage. For corn before tassel, collect 15-20 of the top fully collared leaves at the top of the plant. For corn after tassel, collect 15-20 leaves below and opposite the ear. Sampling of different plant parts will not always correspond with sufficiency values used for interpretation so experience is important

In 2013, we conducted a survey of 45 fields, taking a soil sample and a plant sample at the same time. At most sites, the concentration of the micronutrient in the soil did not correlate with the concentration of the micronutrient in the plant (Figure 1). Graphs a, b, and d show that there is little relationship between the concentration of boron (B), iron (Fe), and zinc (Zn) in the plant and the concentration of the corresponding nutrient in the soil. The concentration of manganese (Mn) in the plant tissue does appear to be a more accurate indicator of the concentration of Mn in the soil as indicated in graph c. In the graphs below, the solid lines indicate critical levels. Since most sites were above the critical level, the supply of the nutrient in question did not limit plant growth. In practical terms, agronomic crops in Nebraska are most commonly constrained from reaching their genetic and environmental potential by the lack of nitrogen and water. However, as crops increasingly achieve sufficient levels of these and other agronomic inputs, micronutrients may become more likely to be the limiting growth factor.

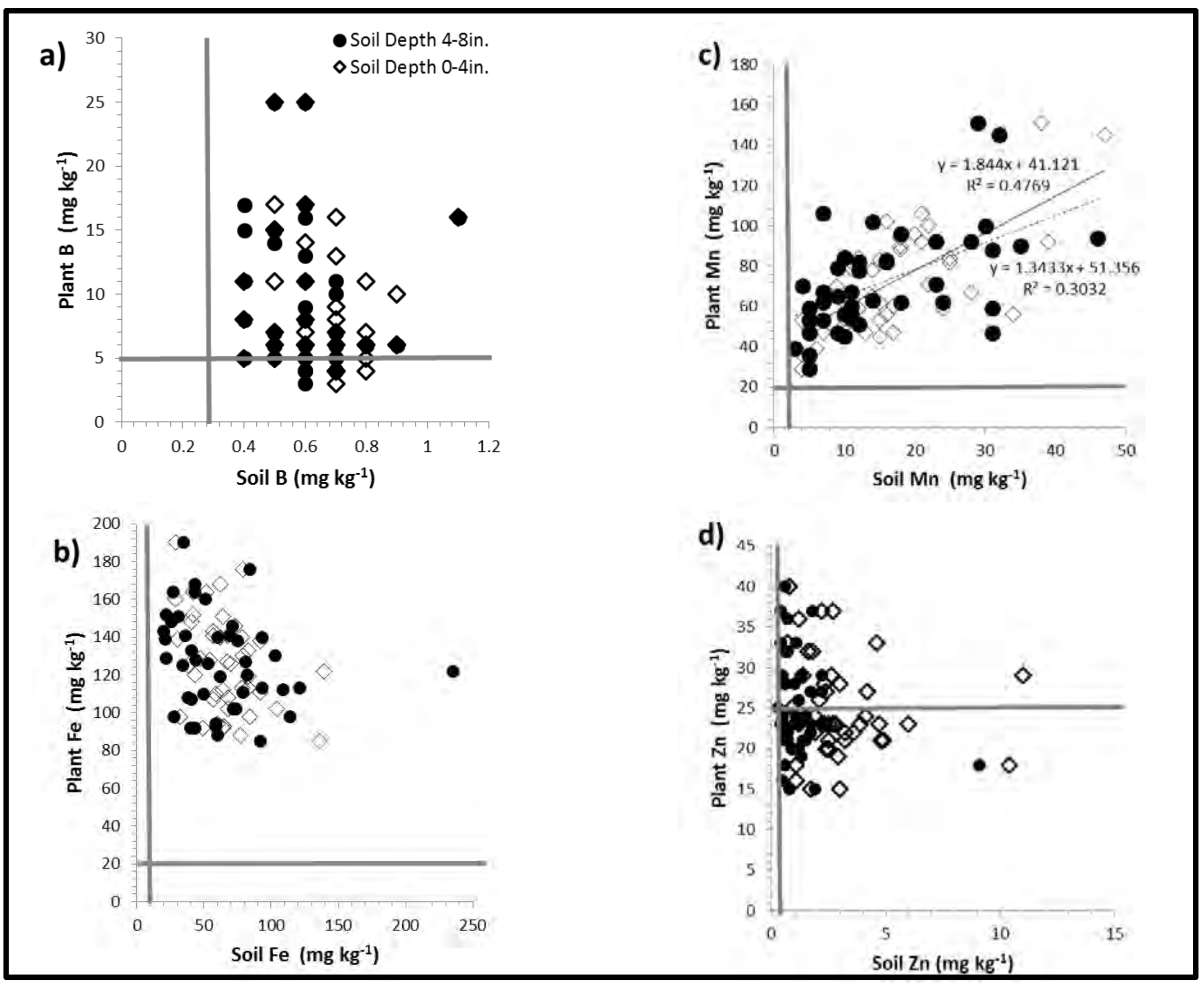


Figure 1 (a-d). Example relationships between soil and corn leaf micronutrient concentrations from 45 locations. Corn critical values are presented as vertical and horizontal lines for leaf samples collected at VT-R5 and soil samples. Soil and leaf samples were collected on the same date. These graphs indicate that B, Fe, Mn and Zn are generally above critical levels in the soil. Zn and occasionally B are below critical levels in plant tissue testing. In most cases, micronutrients concentrations in the soil do not correlate to the micronutrient concentration in the plant tissue.

Introduction to Foliar Micronutrient Supplementation

Micronutrient foliar sprays are widely used in agricultural production and are a complement to soil nutrient amendments. Although plant leaves are specialized in capturing light and CO_2, their ability to regulate absorption of certain nutrients has long been recognized and used in nutrient management. Foliar applied micronutrients have been found to penetrate the leaf surface through the cuticle, cuticular cracks and imperfections, stomata and lenticels (*Figure 2*). This places nutrients at the site of photosynthesis and minimizes disruptions that can occur in movement from the soil to the roots to the leaves. In-depth studies performed in 2014 in Nebraska indicated that approximately 10-15% (depending on the applied nutrient) of the applied foliar micronutrient were retained in corn tissue. In a second trial, greenhouse results indicate that the foliar applied micronutrients are in large part being taken up through the leaves rather than through the roots. The foliar application of micronutrients to correct or avoid micronutrient deficiencies under conditions where soils provide limited availability is commonly practiced worldwide across agronomic and horticultural crops.

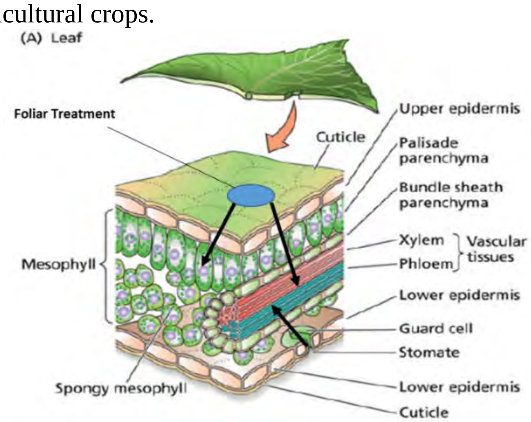


Figure 2. Side view of leaf with a proposed mechanism of foliar micronutrient entry (adapted from Plant Physiology, 4th Edition 2007)

Numerous soil properties can limit nutrient solubility and uptake by plant roots. For example, micronutrients (i.e. Fe, Mn, B, Cu, and Zn) have limited availability in high pH, calcareous soils. Thus, micronutrient foliar sprays are of general interest for use as tools to manage these nutrients and subsequently bypassing soil limitations. Foliar nutrient application is frequently used because plant responses to foliar applied micronutrients are usually more rapid than soil applications and generally have higher recovery rates compared to soil applications.

During the growing seasons of 2013-15, 30 on-farm strip trials and five in-depth studies were performed through a Nebraska Corn Board Grant and in partnership with the Nebraska On-Farm Research Network evaluating the effect of foliar micronutrient (B, Fe, Mn, Zn) application. Trial sites had soil or plant tissue evidence for low micronutrient availability but records of high yield. Though industry parameters reported these sites as deficient to low of the applied micronutrient, very few of the locations had confirmed micronutrient deficiencies.

Trial location yields ranged from 140 to 260 bu/ac with most site averaging yields over 200 bu/ac. Though the data is still preliminary, only two sites had significant yield increases. Four study sites had significant yield decreases and the remaining study sites showed no significant yield differences between the control and foliar micronutrient-treated strips. In most scenarios, foliar micronutrients were effective in increasing the concentration of the applied micronutrient in the plant tissue. See Foliar Micro-Nutrient Studies chapter in the Nebraska On-Farm Research Network 2014 Growing Season Results for more details. http://cropwatch.unl.edu/farmresearch

Where Do Micronutrients Fit in Nebraska?

Nebraska soils are generally fertile and in most cases micronutrient treatments are probably not necessary. However, under limited, prescriptive scenarios, such as low lying, extremely wet, dense soils, foliar micronutrient applications may be beneficial. It should be noted that determining predictable times and locations to apply micronutrients to achieve a profitable yield increase has remained elusive. Without these predictive tools, utilizing foliar micronutrient successfully and consistently will be difficult. As shown in Figure 1, it can be theorized that locations that have both soil and plant tissue samples below critical values may be more likely to see a yield response from micronutrient treatments (this is very rare in Nebraska); whereas locations with plant tissue values below critical values and soil samples at or above critical levels would be less likely to see yield response due to micronutrient applications. In the latter scenario, changes in plant-soil-nutrient interactions may make these soil micronutrients available for plant uptake before micronutrient applications would have any effect such as in the case of Zn and B in Figure 1.

See Micronutrient Management in Nebraska NebGuide G1830 for further information. http://extensionpublications.unl.edu/assets/html/g1830/build/g1830.htm

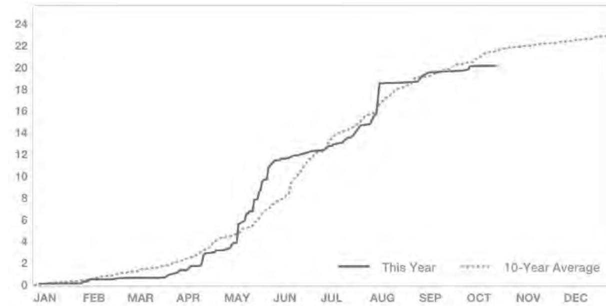
Future Research Results

The lead author of this article, Zach Stewart is a Ph.D. candidate at the University of Nebraska and is expected to graduate in the spring of 2016. This article only partially describes the experiments he has conducted on micronutrient management in corn in Nebraska. Though not available at the time of this publication, be on the lookout for articles discussing a survey of micronutrients from 87 locations in and around Nebraska and their relationship with soil, plant, grain, and yield values; an assessment of the effect of foliarly applied B, Fe, Mn, and Zn applied at different rates and timings in corn production and the fate of the applied micronutrients; a combined analysis of three years of foliar micronutrient strip trial yield and plant concentration data; an assessment of the biofortification potential of foliar Zn and Fe on corn; and a greenhouse study comparing the effect of foliarly applied nanoparticle, chelate, and sulfate forms of Zn and Fe.

The following studies are made possible by support from the Nebraska Corn Board.

Fe Soil and Seed Treatments on Corn Grown on High pH Soil

Study ID: 177029201501
County: Chase
Soil Type: Rosebud loam; Rosebud-Canyon loam; Kuma silt loam;
Planting Date: 5/18/15
Harvest Date: 11/9/15
Population: 31,500
Row Spacing (in.) 30
Hybrid: Prairie Brand 5825
Reps: 6
Previous Crop: Corn
Tillage: Conventional Till (Spring) + Strip-till (prior to planting)
Herbicides: ***Pre:*** unknown ***Post:*** 32 oz/ac RoundUp and Shurestart (recommended rate) on 6/8/15
Seed Treatment: none
Foliar Insecticides: 6.4 oz/ac Tundra (insecticide), through the pivot on 7/23
Foliar Fungicides: none
Fertilizer: 20 Gal/ac 8-20-5-5-0.5 on 04/25 with strip-till, 5 gal/ac 10-34-0 with seed at planting on 5/18; 20 gal/ac 29-0-0-5 on 6/23; 10 gal/ac 28-0-0-5 through pivot on 7/10 and 7/16.
Note: Hail on 7/23, estimated 5.1% by insurance
Irrigation: Pivot, Total: 13
Rainfall (in.):

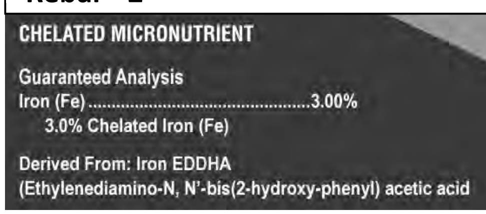


Soil Sample:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	1.7	8.2	22.5	70.0	4.0	99.0	612	236	3799	26.0	3.3	3.0	4.0	0.4	0.9

Introduction: This study is looking at the effect of foliarly-applied Fe (Pro Iron 5), a Fe seed treatment (Rebar 2), and the combination on corn yield and nutrient concentrations in leaf tissue samples under high soil pH conditions (pH 7+). The foliar treatment used in this study was applied at a rate of 1.0 qt/ac and the seed treatment was applied at a rate of 1.0 qt/ac. The foliar treatment was applied with a high clearance applicator on June 25th at the V5 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.

Rebar® 2



Product information from: *https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Rebar 2 Label2.pdf*

Pro-Iron 5

Active Ingredient
6 – Total Nitrogen (N)
5 – Chelated Iron (Fe)
3 – Sulfur (S)

Product information from: *https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/PRO-IRON_5_6-0-0_Label.pdf*

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	180 A*	$657.00
Rebar 2 (1 qt/ac)	177 A	$624.18
Pro Iron 5 (1 qt/ac)	174 A	$623.23
Pro Iron 5 (1 qt/ac) + Rebar 2 (1 qt/ac)	175 A	$613.13
P-Value	0.6964	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $15/gal Pro Iron 5, $55/gal Rebar 2, and $8.12 high-clearance ground application cost.

Plant Tissue Samples

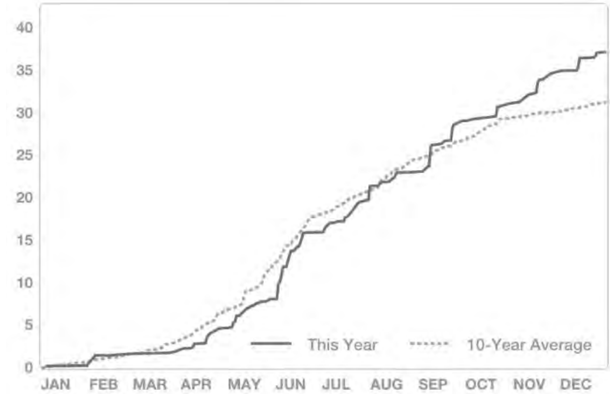
	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.27 A	0.36 A	2.94 A	0.22 A	0.53 A	0.30 A	0.005 A	72 A	97 A	12 A	12.80 A	57 A
Rebar 2	3.40 A	0.37 A	2.89 A	0.23 A	0.57 A	0.31 A	0.005 A	69 A	108 A	11 A	12.80 A	61 A
Pro Iron 5	3.27 A	0.39 A	3.12 A	0.22 A	0.53 A	0.29 A	0.007 A	68 A	98 A	11 A	12.20 A	54 A
Pro Iron 5 + Rebar 2	3.22 A	0.35 A	3.04 A	0.21 A	0.52 A	0.27 A	0.005 A	81 A	100 A	12 A	12.20 A	51 A
P-Value	0.2874	0.4066	0.8074	0.6406	0.3446	0.3562	0.0988	0.2662	0.4072	0.7201	0.5262	0.19

Summary: The products tested did not result in yield or foliar leaf tissue nutrient content differences.

Foliar Micronutrients on Corn

Study ID: 192121201501
County: Merrick
Soil Type: Cozad loam; Alda loam; Platte-Gothenburg complex;
Planting Date: 4/25/15
Harvest Date: 11/9/15
Population: 32,000
Row Spacing (in.) 36
Hybrid: Unknown
Reps: 6
Previous Crop: Unknown
Tillage: Minimum Till
Herbicides: 2 qt/ac Keystone
Seed Treatment: Unknown
Foliar Insecticides: Unknown
Foliar Fungicides: Unknown

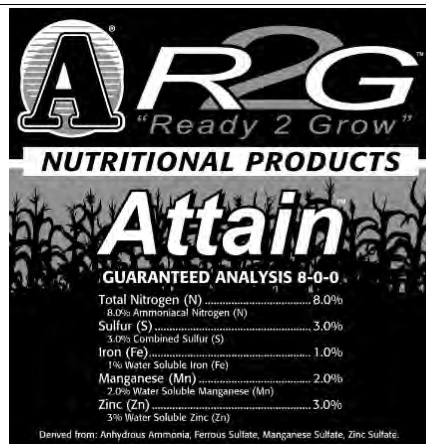
Fertilizer: Unknown
Irrigation: Gravity, Total: Unknown
Rainfall (in.):



Soil Sample:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	2.7	7.1	14.1	47.3	45.0	99.4	595	301	1983	36.6	4.1	6.8	14.3	0.4	0.9

Introduction: This study is looking at the effect of foliarly-applied Attain (N, S, Fe, Mn, Zn) and N-Cline Slow Release Nitrogen (28-0-0) on corn yield and nutrient concentrations in leaf tissue samples. The foliar treatment used in this study was applied at a rate of 1.0 qt/ac, tank mixed with N-Cline which was applied at a rate of 1.0 gal/ac, and was applied with a high clearance applicator on June 23rd at the V7 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.



Product information from: *http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CATTAIN_8_0_0_5_9_2013_12_17_32_PM.pdf*

Product information from: *http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CN_CLINE_28_0_0_5_9_2013_12_17_46_PM.pdf*

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	218 A*	$795.70
Attain + N-Cline	227 A	$806.93
P-Value	0.1249	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $22/gal Attain, $8/gal N-Cline, and $8.12 ground application cost.

Plant Tissue Samples

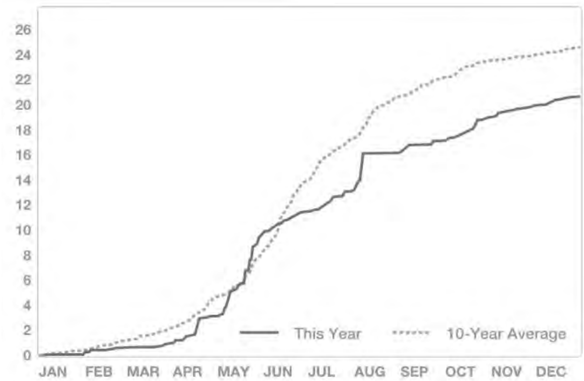
	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	2.97 A	0.29 B	2.63 A	0.15 A	0.31 A	0.19 A	0.004 A	72 A	60 B	6 A	7.83 A	21 A
Attain + N-Cline	3.14 A	0.31 A	2.68 A	0.14 A	0.29 A	0.18 A	0.007 A	79 A	69 A	7 A	7.50 A	21 A
P-Value	0.2135	0.0812	0.7374	0.4838	0.5045	0.8417	0.3339	0.1767	0.0484	0.5007	0.6109	0.8717

Summary: While there was not a significant yield difference at the alpha level of 0.10, there was a 9.5 bu/ac increase for using the Attain + N-Cline treatment and the p-value was nearing significance (p=0.0.1249). Foliar samples showed phosphorus and manganese were significantly higher for the Attain + N-Cline treatment. Because two products were used together, it is not known which is responsible for potential yield differences.

Foliar Iron Fertilizer on Corn

Study ID: 191029201501
County: Chase
Soil Type: Rosebud loam; Canyon loam;
Planting Date: 4/25/15
Harvest Date: 11/21/15
Population: 31,000
Row Spacing (in.) 30
Hybrid: Pioneer 1151
Reps: 4
Previous Crop: Corn
Tillage: Minimum Till
Herbicides: ***Pre:*** 2 pt/ac Dual ***Post:*** 32 oz/ac Roundup
Seed Treatment: None
Foliar Insecticides: None
Foliar Fungicides: None

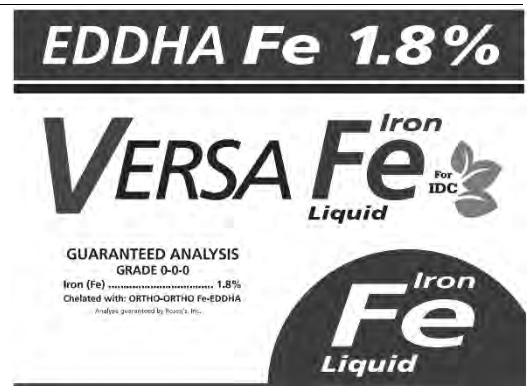
Fertilizer: 240 lbs N/ac
Note: No Hail
Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Soil Samples:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	2.5	8.0	21.4	41.0	39.0	118.0	528	192	3695	15.0	5.2	2.0	10.0	0.7	1.0

Introduction: This study is looking at the effect of foliarly-applied Versa Iron (Fe) liquid Fe on corn yield and nutrient concentrations in leaf tissue samples under high soil pH conditions (pH 7+). The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially on June 26th at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.



Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	197 A*	$719.05
Versa Fe liquid Fe + Lockdown surfactant	209 A	$737.00
P-Value	0.1273	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $25/gal Versa Fe, $2.40/lb Lockdown, and $9.50 aerial application cost.

Plant Tissue Samples

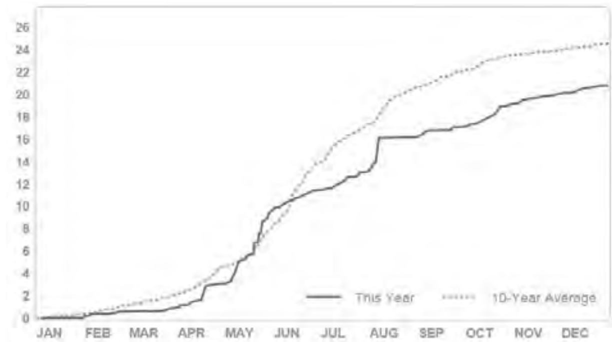
	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.12 A	0.47 A	3.49 A	0.15 A	0.31 A	0.21 B	0.006 A	56 A	72 A	11 A	10.50 A	42 A
Versa Fe	3.38 A	0.53 A	3.47 A	0.14 A	0.34 A	0.22 A	0.005 A	68 A	71 A	12 A	10.75 A	41 A
P-Value	0.2684	0.1266	0.9105	0.4444	0.2412	0.0577	0.7027	0.1038	0.8961	0.5195	0.391	0.9129

Summary: While there was not a significant yield difference at the alpha level of 0.10, there was a 12 bu/ac increase for using the Versa Iron treatment and the p-value was nearing significance (p=0.1273). Additionally, while foliar iron test was not significantly different, the p-value was also nearing significance (p=0.1038) and was higher for the Versa Iron treatment. Foliar samples showed sulfur was significantly different between the treated and untreated check.

Foliar Iron Fertilizer on Corn

Study ID: 191029201502
County: Chase
Soil Type: Rosebud loam; Canyon loam;
Planting Date: 4/25/15
Harvest Date: 11/21/15
Population: 31,000
Row Spacing (in.) 30
Hybrid: Pioneer 1151
Reps: 4
Previous Crop: Corn
Tillage: Minimum Till
Herbicides: ***Pre:*** 2 pt/ac Dual ***Post:*** 32 oz/ac Roundup
Seed Treatment: None
Foliar Insecticides: None

Foliar Fungicides: None
Fertilizer: 240 lbs/ac Nitrogen
Note: No hail
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Soil Samples:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	2.3	7.8	18.8	53.0	51.0	144.0	495	175	3216	17.0	6.7	2.0	10.0	0.6	1.0

Introduction: This study is looking at the effect of foliarly-applied Versa Iron (Fe) liquid Fe on corn yield and nutrient concentrations in leaf tissue samples. The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially on June 26th at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.

Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	211 B*	$770.15
Versa Fe liquid Fe + Lockdown surfactant	221 A	$780.81
P-Value	0.012	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $25/gal Versa Fe, $2.40/lb Lockdown, and $9.50 aerial application cost.

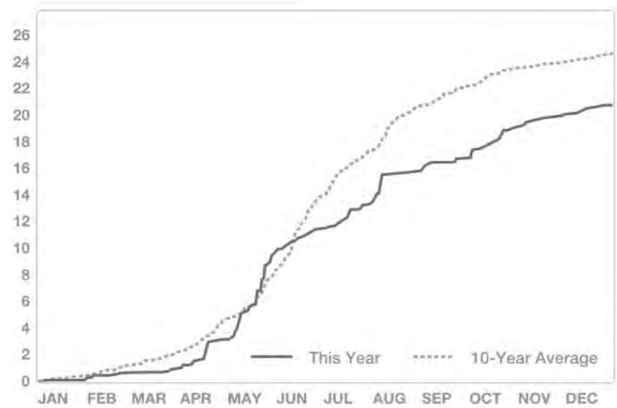
Plant Tissue Samples												
	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.03 A	0.45 B	3.33 A	0.15 A	0.33 A	0.20 A	0.003 A	60 A	67 A	11 A	10.25 A	40 A
Versa Fe	3.17 A	0.50 A	3.23 A	0.14 A	0.34 A	0.21 A	0.003 A	70 A	69 A	12 A	11.25 A	43 A
P-Value	0.3503	0.019	0.7198	0.1817	0.4481	0.4119	1	0.1938	0.7521	0.6042	0.2522	0.5424

Summary: The Versa Iron treatment had a significantly higher yield than the check. The Versa Iron treatment also had significantly higher foliar phosphorus than the check.

Foliar Iron Fertilizer on Corn

Study ID: 197029201502
County: Chase
Soil Type: Tassel-Duda loamy sand; Blanche sandy loam;
Planting Date: 4/28/2015
Harvest Date: 10/28/15
Population: 31,000
Row Spacing (in.) 30
Hybrid: Channel 209-69 VT3PRIB
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** 0.375 gal/ac LUMAX and 0.25 gal/ac Touchdown on 4/30/15 after planting. ***Post:*** 0.048 gal/ac Dual II Magnum, 0.45 gal/ac Halex, and 0.25 gal/ac Touchdown on 6/18/15; 25 gal/ac Touchdown on 7/7/15.
Seed Treatment: none
Foliar Insecticides: none
Foliar Fungicides: none

Fertilizer: 96 lb/ac 11-50-0 and 63 lb/ac 21-0-0-24 S on 4/24/15; 222 lb/ac 32-0-0 on 4/29/15; 400 lb/ac 28-0-0-5 S sidedress on 6/10/15; 12 gal 26-0-35 + 7 gal 32-0-0 on 6/20/15 and 7/17/15 through pivot.
Irrigation: Pivot, Total:
Rainfall (in.):



Soil Samples:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	1.7	7.2	16.9	70.0	44.0	140.0	332	148	2956	13.0	5.6	2.0	13.0	0.6	0.6

Introduction: This study is looking at the effect of foliarly-applied Versa Iron (Fe) liquid Fe on corn yield and nutrient concentrations in leaf tissue samples under high soil pH conditions (pH 7+). The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially on June 26th at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.

Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac) ‡
Check	191 A*	$697.15
Versa Fe liquid Fe + Lockdown surfactant	196 A	$689.55
P-Value	0.4946	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $25/gal Versa Fe, $2.40/lb Lockdown, and $9.50 aerial application cost.

Plant Tissue Samples

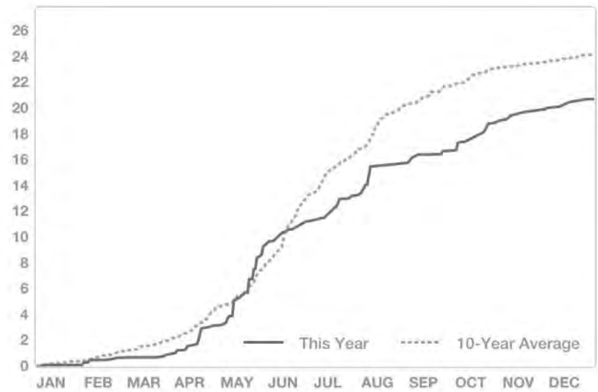
	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.27 A	0.36 A	2.63 B	0.15 A	0.44 A	0.22 A	0.0050 A	80 A	48 A	16 A	9.00 A	27 A
Versa Fe	3.45 A	0.39 A	3.05 A	0.13 A	0.40 A	0.23 A	0.0048 A	86 A	66 A	17 A	12.00 A	33 A
P-Value	0.2674	0.1682	0.0443	0.5181	0.4384	0.4444	0.9379	0.7305	0.3526	0.9571	0.5424	0.1266

Summary: The application of Versa Iron did not result in a significant yield difference. Foliar potassium levels were higher for the Versa Iron treatment.

Foliar Iron Fertilizer on Corn

Study ID: 197029201503
County: Chase
Soil Type: Tassel-Duda loamy sand; Jayem loamy fine sand; Valent sandy loam; Ascalon fine sandy loam;
Planting Date: 5/8/15
Harvest Date: 10/28/15
Population: 34000
Row Spacing (in.) 30
Hybrid: R98114
Reps: 4
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 40 oz/ac Touchdown on 4/25/15; 57 oz/ac Bicep + Dual II Magnum and 32 oz/ac Touchdown on 5/14/15 ***Post:*** 1 pt/ac Dual via Pivot on 6/19/15
Seed Treatment: unknown
Foliar Insecticides: 6.4 oz/ac Tunder on 7/31/15
Foliar Fungicides: 10.5 oz/ac Quilt Xcel on 7/9/15 and 7/31/15
2 pt/ac NuCop on 7/31/15

Fertilizer: 37 lb/ac 11-52-0 on 4/28/15;
65 lb/ac 0-0-60 on 4/28/15;
65 lb/ac 21-0-0-24S on 4/28/15;
5 gal/ac 5-8-15 Bin Buster Starter;
110 lbs/ac 5-14 + 32-0-0;
38 gal/ac 26-0-3-5 via Pivot on 6/24/15 and 7/18/15
Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Soil Samples:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	1.8	7.5	17.7	84.0	13.0	130.0	390	146	3087	13.0	5.9	2.0	8.0	0.7	0.6

Introduction: This study is looking at the effect of foliarly-applied Versa Iron (Fe) liquid Fe on corn yield and nutrient concentrations in leaf tissue samples under high soil pH conditions (pH 7+). The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially on June 26th at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.

Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Results:

	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Check	208 A*	$759.20
Versa Fe liquid Fe + Lockdown surfactant	210 A	$740.65
P-Value	0.5905	N/A

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn, $25/gal Versa Fe, $2.40/lb Lockdown, and $9.50 aerial application cost.

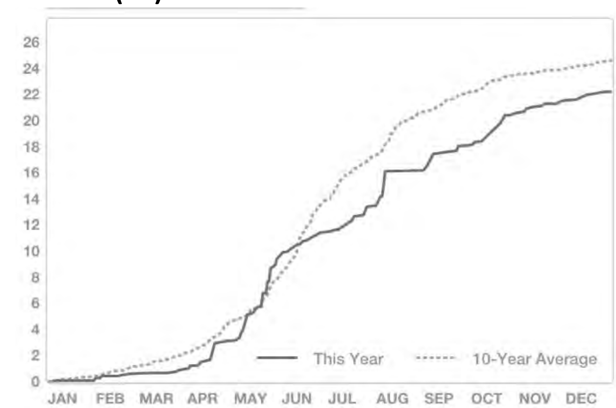
Plant Tissue Samples												
	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.11 A	0.39 A	3.33 A	0.15 A	0.42 A	0.22 A	0.006 A	69 A	58 A	12 A	8.75 B	30 A
Versa Fe	3.31 A	0.40 A	3.23 A	0.13 A	0.41 A	0.23 A	0.007 A	72 A	57 A	16 A	9.75 A	30 A
P-Value	0.2535	0.6173	0.6955	0.4309	0.9282	0.1411	0.312	0.4849	0.5862	0.3575	0.0917	0.8716

Summary: The application of Versa Iron (Fe) on corn did not result in different yields. Leaf tissue samples from the Versa Iron (Fe) treatment had higher foliar concentrations of copper.

Foliar Iron Fertilizer on Popcorn

Study ID: 190029201502
County: Chase
Soil Type: Woodly fine sandy loam; Ascalon fine sandy loam;
Planting Date: 5/2/15
Harvest Date: 10/20/15
Population: 29,000
Row Spacing (in.) 15
Hybrid: 427
Reps: 4
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** Lumax on 5/14/15 ***Post:*** 2 oz/ac Mustang Max and 4 oz/ac Status on 6/13/15; 12 oz/ac Medal on 7/1/15
Seed Treatment: Cruzer 250
Foliar Insecticides: Unknown
Foliar Fungicides: Quilt on 7/23/15

Fertilizer: 30 lb/ac 30-30-0-5 Dry on 4/1/15; 40 lb/ac 32-0-0 on 5/4/15; 29 lb/ac 32-0-0 on 7/8/15 and 7/22/15
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Soil Samples:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	1.0	6.1	7.8	20.0	43.0	52.0	210	170	957	10.0	2.7	6.0	48.0	1.3	0.4

Introduction: This study is looking at the effect of foliarly-applied Versa Iron (Fe) liquid Fe on corn yield and nutrient concentrations in leaf tissue samples under high soil pH conditions (pH 7+). The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially on June 26th at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.

Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Results:

	Yield (bu/ac)†	Yield (lb/ac) †	Marginal Net Return ($/ac)‡
Check	119 A*	6,652 A	$1263.88
Versa Fe	121 A	6,779 A	$1262.16
P-Value	0.2833	0.2833	N/A

†Bushels per acre and lb per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $0.19/lb popcorn, $25/gal Versa Fe, $2.40/lb Lockdown, and $9.50 aerial application cost.

Plant Tissue Samples

	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.81 A	0.44 A	2.89 A	0.19 A	0.45 A	0.28 A	0.004 A	124 A	71 A	21 A	13.25 A	47 A
Versa Fe	3.75 A	0.42 A	2.98 A	0.20 A	0.44 A	0.26 A	0.005 A	116 A	67 A	21 A	12.50 A	45 A
P-Value	0.7109	0.4406	0.4586	0.7177	0.576	0.2452	0.7888	0.327	0.3985	0.8675	0.391	0.4166

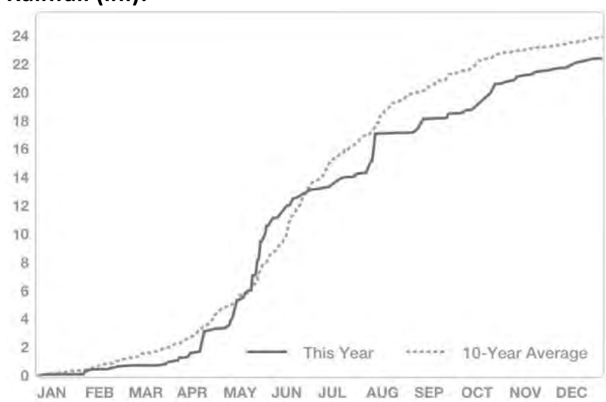
Summary: At this site, there was no yield or foliar differences between the Versa Iron (Fe) treatment and the check.

Foliar Iron Fertilizer on Popcorn

Study ID: 197029201501
County: Chase
Soil Type: Tassel-Duda loamy sand; Blanche very fine sandy loam;
Planting Date: 4/28/2015
Harvest Date: 11/18/15
Population: 31,000
Row Spacing (in.) 30
Hybrid: Channel 209-69 VT3PRIB
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** 0.375 gal/ac LUMAX and 0.25 gal/ac Touchdown on 4/30/15 after planting. ***Post:*** 0.048 gal/ac Dual II Magnum, 0.45 gal/ac Halex, and 0.25 gal/ac Touchdown on 6/18/15. 25 gal/ac Touchdown on 7/7/15.
Seed Treatment: none
Foliar Insecticides: none
Foliar Fungicides: none

Fertilizer: 96 lb/ac 11-50-0 and 63 lb/ac 21-0-0-24 S on 4/24/15; 222 lb/ac 32-0-0 on 4/29/15; 400 lb/ac 28-0-0-5 S sidedress on 6/10/15; 12 gal 26-0-35 + 7 gal 32-0-0 on 6/20/15 and 7/17/15 through pivot.

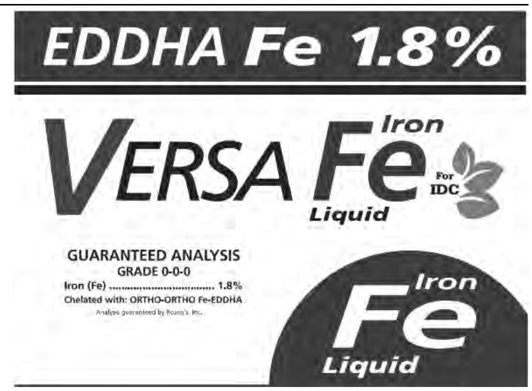
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Soil Samples:

Depth	O.M.	pH	C.E.C.	Total NO3	P Bray 1	P Bray 2	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B
	--%--			---lb/ac---	ppm										
0-8"	1.8	6.3	13.9	34.0	66.0	120.0	502	241	1815	14.0	2.8	6.0	26.0	1.2	0.5

Introduction: This study is looking at the effect of foliarly-applied Versa Iron (Fe) liquid Fe on popcorn yield and nutrient concentrations in leaf tissue samples under high soil pH conditions (pH 7+). The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially on June 26th at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor.



Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Results:

	Yield (bu/ac)†	Yield (lb/ac) †	Marginal Net Return ($/ac)‡
Check	78 A*	4,387 A	$833.53
Versa Fe	78 A	4,393 A	$808.82
P-Value	0.9692	0.9692	N/A

†Bushels per acre and lb per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $0.19/lb popcorn, $25/gal Versa Fe, $2.40/lb Lockdown, and $9.50 aerial application cost.

Plant Tissue Samples

	N	P	K	Mg	Ca	S	Na	Fe	Mn	B	Cu	Zn
	(%)							ppm				
Check	3.15 A	0.36 B	3.45 A	0.17 A	0.33 A	0.20 A	0.002 A	92 A	51 A	8 A	7.25 A	30 A
Versa Fe	3.20 A	0.39 A	3.62 A	0.16 A	0.33 A	0.21 A	0.002 A	94 A	48 A	8 A	7.50 A	32 A
P-Value	0.8388	0.0462	0.4589	0.7529	0.8962	0.391	0.1817	0.7333	0.5123	1	0.7177	0.4596

Summary: The application of Versa Iron (Fe) on popcorn did not result in different yields. Leaf tissue samples from the Versa Iron (Fe) treatment had higher foliar concentrations of phosphorus.

Combined Analysis of Foliar Iron Fertilizer on Corn

Introduction: There were four corn studies and two popcorn studies looking at the same foliar micronutrient product. The foliar treatment used in this study was applied at a rate of 2.5 qt/ac, mixed with Lockdown surfactant (0.3 lbs/ac), and was applied aerially at the V6 growth stage. Leaf samples were collected from treated and untreated strips approximately 1 month after application and analyzed for nutrient concentrations. Yields from treated and untreated strips were recorded with a yield monitor. Product ingredient information is at right.

Product information from:
http://www.agrian.com/pdfs/Versa_Fe_Liquid_Label1.pdf

Yield and foliar nutrient concentrations from these six sites are summarized in this report. Data analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was done with Fisher's LSD.

Versa Fe liquid Fe + Lockdown surfactant on corn (4 sites, 16 total reps)													
	Yield	**N**	**P**	**K**	**Mg**	**Ca**	**S**	**Na**	**Zn**	**Mn**	**B**	**Fe**	**Cu**
	bu/ac	**---------------%---------------**							**----------ppm----------**				
Treatment mean (treated-check)†	7.1	0.19	0.04	0.05 ns	0.01	0.002 ns	0.01	0.0001 ns	2.25 ns	4.25 ns	1.31 ns	8.06 ns	1.31 ns
Site (P>F)	0.04	0.4426	<.0001	0.0173	0.9332	0.0169	0.2096	0.0972	0.0068	0.0644	0.2879	0.0417	0.7878
Treatment (P>F)	0.0083	0.0236	0.0031	0.6411	0.0796	0.9207	0.0372	0.8802	0.2976	0.332	0.5266	0.1218	0.262
Site*Treatment (P>F)	0.39	0.9515	0.4311	0.2621	0.9396	0.5874	0.95	0.8742	0.694	0.392	0.9391	0.9144	0.8391
Versa Fe liquid Fe + Lockdown surfactant on popcorn (2 sites, 8 total reps)													
	Yield	**N**	**P**	**K**	**Mg**	**Ca**	**S**	**Na**	**Zn**	**Mn**	**B**	**Fe**	**Cu**
	bu/ac	**---------------%---------------**							**----------ppm----------**				
Treatment mean (treated-check)	1.1 ns	-0.006 ns	0.006 ns	0.13 ns	-0.001 ns	-0.01 ns	-0.004 ns	-0.0001 ns	0.25 ns	-3.75 ns	0.125 ns	-3.63 ns	-0.25 ns
Site (P>F)	<.0001	0.0015	0.021	0.0009	0.1047	0.0081	<.0001	0.0025	0.0194	0.0173	<.0001	0.0053	<.0001
Treatment (P>F)	0.523	0.9563	0.5863	0.2257	0.924	0.6555	0.5601	0.7796	0.9055	0.2692	0.8847	0.4261	0.6278
Site*Treatment (P>F)	0.5635	0.6252	0.0716	0.7156	0.6365	0.8223	0.1138	0.4136	0.2617	0.8764	0.8847	0.2729	0.3464

†Mean difference between control and treatment. Negative values indicate the control value is greater than the treated value.
ns indicates mean difference is not significant at alpha = 0.10

Summary: Verse Fe liquid Fe resulted in a significant yield increase of 7.1 bu/ac in corn when looking at all sites together. The two popcorn sites did not have a significant yield increase. At $3.65/bu corn prices, the yield increase is enough to break even on product and application costs ($25/gal Versa Fe, $2.40/lb Lockdown surfactant, and $9.50 aerial application).

Project SENSE

Sensors for Efficient N use and Stewardship of the Environment

The Nebraska On-Farm Research Network launched a new project in 2015, focused on improving the efficiency of nitrogen fertilizer use. Project SENSE (Sensors for Efficient Nitrogen Use and Stewardship of the Environment) is a three year project, which looks at using crop canopy sensors to direct variable-rate, in-season nitrogen application in corn. 17 on-farm research sites were selected in 2015 (Figure 1). These sites were located in five Natural Resource Districts: Central Platte, Little Blue, Lower Loup, Lower Platte North, and Upper Big Blue. Since 1988, the nitrate concentration in groundwater in Nebraska's Central Platte River Valley has been steadily declining, largely due to the conversion from furrow to center-pivot irrigation. However, over the last 25 years, fertilizer nitrogen use efficiency has remained static. This trend points to the need for adoption of available technologies such as crop canopy sensors for further improvement in nitrogen use efficiency. Strategies which direct crop nitrogen status at early growth stages are promising as a way to improve nitrogen fertilizer efficiency.

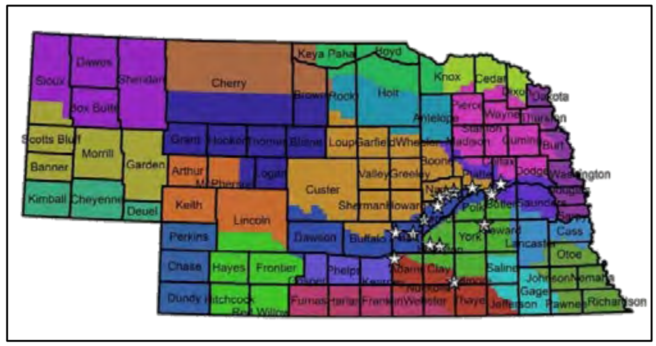


Figure 1: Locations of 17 on-farm research sites in 5 Natural Resource Districts using crop canopy sensors to direct in-season N management in 2015.

Managing Variability with Sensors

It is difficult to determine the optimum amount of nitrogen to apply in a field; nitrogen needs in a field vary spatially and from year to year. Because crop canopy sensors are designed to be responsive to nitrogen needs, they can help account for this variability. Another challenge with nitrogen management is that all the nitrogen for the crop is often applied prior to the growing season, before the crop begins to rapidly uptake nitrogen. This results in unnecessary losses of nitrogen from the cropping system and has negative economic and environmental implications. Applying a portion of the total nitrogen during the growing season helps better match nitrogen availability to the time the crop uptakes nitrogen.

Active sensors work by emitting light onto the crop canopy and then measuring reflectance from the canopy with photodetectors (Figure 2). The light source simultaneously emits visible and near infrared light, which is detected synchronously by sensor electronics. When used to detect plant health, light in both the visible (VIS; 400-700 nm) and near-infrared (NIR; 700-1000 nm) portions of the electromagnetic spectrum are generally measured. These wavelengths are combined to create various vegetation indices (VI), such as the commonly used normalized difference vegetation index (NDVI), that are correlated with specific crop conditions of interest. Algorithms are then used to translate the NDVI values into an in-season nitrogen recommendation rate.

Figure 2: Active crop canopy sensor positioned over corn canopy.

Getting Started

Figure 3: High clearance applicator equipped with OptRx® crop canopy sensors, GPS, and drop nozzles.

For the 2015 on-farm research experiments, a high clearance applicator was equipped with an Ag Leader® Integra in-cab monitor and 2 OptRx® sensors. A master module enables connection between the OptRx® sensors and Ag Leader® in-cab monitor. An application rate module communicates the target rate from the Ag Leader® monitor to the rate controller. A GPS receiver is not required for sensing but may be used for applicator ground speed and as-applied mapping. The applicator was equipped with drop nozzles in order to apply UAN fertilizer to the crop as it was sensed (Figure 3).

Project SENSE plots were arranged in a randomized complete block design with 6 replications. The grower's normal N management was compared to the Project SENSE N Management. For the Project SENSE strips, a base rate (75 lb N/ac for most sites) was applied at planting or very early in the growing season. Between V8 and pre-tassel, corn was sensed with the crop canopy sensors and variable-rate N was applied on-the-go. Grower N rates were noted and in-season Project SENSE N rates were logged and averaged. At harvest, yield monitor data was recorded, logged, and averaged. For each site, the average difference in N applied (lb/ac) and average difference in yield (bu/ac) was calculated. Nitrogen use efficiency (NUE) was also calculated as partial factor productivity of N (lb grain/lb N fertilizer) and as lb N applied per bushel of grain produced.

2015 All Site Results

Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD. Results of 15 on-farm research experiment sites were summarized. Over all sites combined, the project SENSE N management resulted in a reduction of 40 lb N/acre when compared to the grower N management. This resulted in a loss of 5 bu/ac averaged across all sites. NUE was greater for the project SENSE N management, using only 0.67 lb of N to produce a bushel of grain compared to the grower management which used 0.85 lb of N to produce a bushel of grain. Marginal net return was $10.35/ac greater for the project SENSE management strategy when factoring in the N fertilizer and grain prices only. Summaries for each site are presented in the following pages of this report.

	N Rate (lb/ac)	Yield (bu/ac)	PFPn	Lb N/bu	Marginal Net Return ($/ac)
Grower N Management	195	227 A*	66 B	0.88 A	701.80
Project SENSE N Management	155	222 B	86 A	0.71 B	712.15
P-Value	*N/A*	*<.0001*	*<.0001*	*<.0001*	*N/A*

*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

An analysis was conducted to determine the breakeven acreage on the additional equipment needed to implement this method of N application. It was assumed that a spray rig, rate controller, and GPS are already owned. An N fertilizer price of $0.65/lb, corn price of $3.65/bu, and OptRx® price of $13,400 (includes 2 sensors, brackets, and AgLeader® monitor) was used in the calculation. The OptRx® system resale was assumed to be 10%. The breakeven acreage was calculated using average N and yield differences from all sites combined. Figure 4 shows how many acres would need to be fertilized each year using the system to break even in a given time frame. In two years, one could expect to break even on the equipment if they were using the equipment on 667 acres of corn. This calculation was based on N fertilizer and yield differences experienced this year; continuing this project over the next two years will allow for a better understanding of the range of results that may be expected and how this will influence the breakeven analysis.

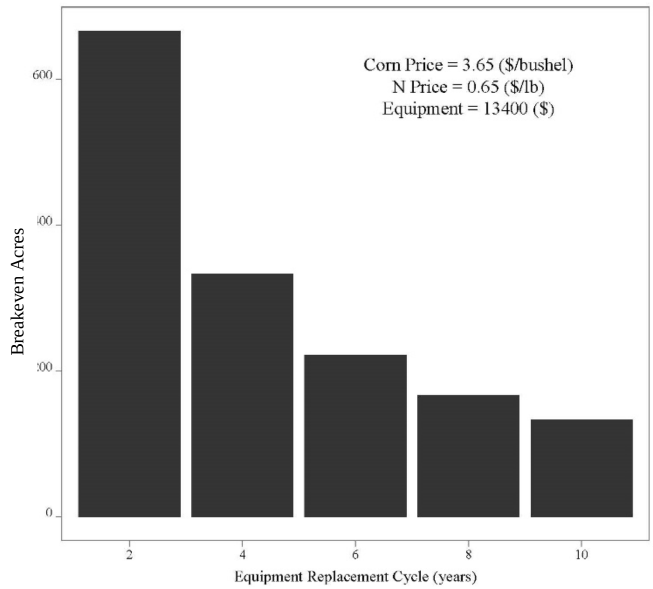


Figure 4: Breakeven acres for the sensor system given a 2, 4, 6, 8, and 10 year equipment replacement cycle.

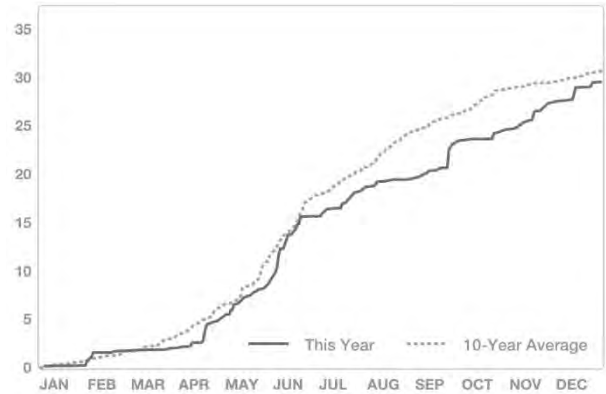
Continuing On

Project SENSE will continue in 2016 and 2017 with a goal of 20 on-farm research experiment sites each year (4 in each of the 5 NRDs represented). Additionally field demonstration days will continue to be held in each NRD to showcase the equipment, teach how it is used, and present study results.

Project SENSE (Sensor-based In-season N Management)

Study ID: 209079201501
County: Hall
Soil Type: Jansen fine sandy loam;
Planting Date: 5/06/15
Harvest Date: 10/30/15
Population: 33,000
Row Spacing (in.) 30
Hybrid: 713 Nutec Triplestack
Reps: 6
Previous Crop: Corn
Tillage: Ridge-Till and Cultivate
Herbicides: ***Pre:*** ***Post:*** Post emerge: 0.75 oz/ac Armezon and 1 qt/ac Atrazine
At V4: 22 oz/ac Roundup
Seed Treatment: Herculex Xtra
Foliar Insecticides: 11 oz/ac Headline Amp applied with pivot at tassel
Foliar Fungicides: unknown

Note: Very wet June, water ponded in field, leaching, yellow corn.
Irrigation water nitrate: 2.8 ppm
Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 85 lbs N/acre applied near planting. A side-dress rate of 140 lbs N/acre was applied. Total grower N application was 225 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 85 lbs N/acre were applied near planting. Crop canopy sensing and application occurred on 6/30/15 at the V9 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 119 lbs N/acre with a minimum rate of 31 lbs N/acre, and maximum rate of 209 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	225	239 A*	60 A	0.94 A	$726.10
Project SENSE N Management	204	234 A	64 A	0.87 A	$721.50
P-Value	N/A	0.3276	0.0648	0.0595	N/A

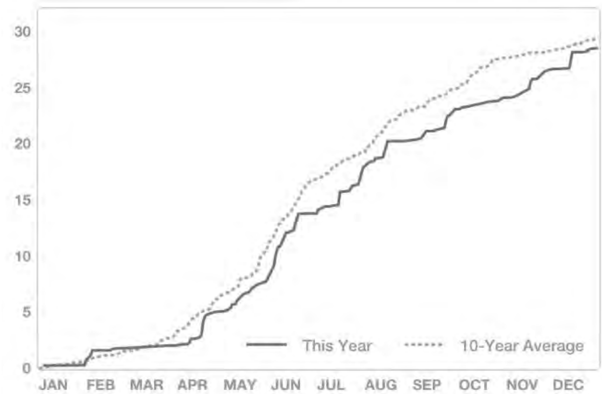
†Wet bushels per acre. Moisture data not available to correct to standard moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 21 lb/acre lower than the grower's N application. There was no statistical difference in yield between the two treatments. There was no difference in nitrogen use efficiency.

Project SENSE (Sensor-based In-season N Management)

Study ID: 205079201501
County: Hall
Soil Type: Hord silt loam;
Planting Date: unknown
Harvest Date: 10/20/15
Population: unknown
Row Spacing (in.) 30
Hybrid: unknown
Reps: 6
Previous Crop: unknown
Tillage: unknown
Herbicides: ***Pre:*** unknown ***Post:*** unknown
Seed Treatment: unknown
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Note: Irrigation water nitrate: 10 ppm
Irrigation: pivot, Total: unknown
Rainfall (in.):



Introduction:

This study compares crop canopy sensor based in-season N application to the grower's standard N mangement.

Grower Nitrogen Treatment: The grower initial N rate was 3.5 lbs N/acre applied at planting. A side-dress rate of 155 lbs N/acre was applied. Total grower N application was 158.5 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 3.5 lbs N/acre were applied at planting with an additional 71.5 lbs N/acre added on 6/2/15. Crop canopy sensing and application occurred on 6/25/15 at the V11 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 53 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 282 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

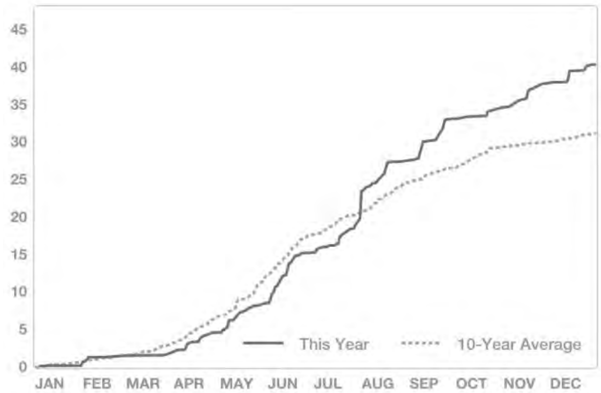
	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	159	238 A*	84 B	0.67 A	$765.35
Project SENSE N Management	128	237 A	106 A	0.54 B	$781.85
P-Value	N/A	0.3960	0.0180	0.0051	N/A

†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 31 lb/acre lower than the grower's N application. There was no yield difference between the two treatments. Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year due to saved N with no yield penalty.

Project SENSE (Sensor-based In-season N Management)

Study ID: 207121201501
County: Merrick
Soil Type: O'Neill sandy loam; Blendon fine sandy loam; O'Neill loam; Wann loam; Lamo-Saltine complex;
Planting Date: unknown
Harvest Date: 11/6/15
Population: unknown
Row Spacing (in.) 30
Hybrid: unknown
Reps: 6
Previous Crop: Unknown
Tillage: Unknown
Herbicides: ***Pre:*** Unknown ***Post:*** unknown
Seed Treatment:
Foliar Insecticides: unknown
Foliar Fungicides: unknown
Note: Irrigation water nitrate: 20 ppm
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction:

This study compares crop canopy sensor based in-season N application to the grower's standard N mangement.

Growen Nitrogen Treatment: The grower initial N rate was 40 lbs N/acre applied at planting. A side-dress rate of 135 lbs N/acre was applied. Total grower N application was 175 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 40 lbs N/acre were applied at planting. Crop canopy sensing and application occurred on 6/20/15 at the V10 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 68 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 298 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

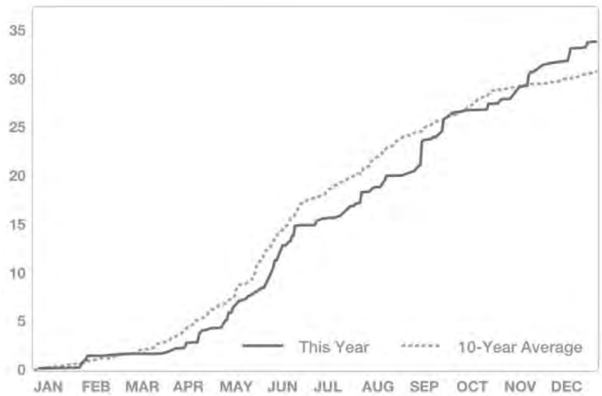
	Total N rate (lb/ac)	**Yield (bu/ac)†**	**Partial Factor Productivity of N (lb grain/lb N)**	**lbs N/ bu grain**	**Marginal Net Return‡**
Grower N Management	175	283 A*	91 B	0.61 A	$919.20
Project SENSE N Management	108	282 A	153 A	0.38 B	$959.10
P-Value	N/A	0.4000	0.0047	0.0017	N/A

†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 67.5 lb/acre lower than the grower's N application. There was no yield difference between the two treatments. Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year due to saved N with no yield penalty.

Project SENSE (Sensor-based In-season N Management)

Study ID: 208121201501
County: Merrick
Soil Type: Gibbon loam; Leshara silt loam;
Planting Date: 5/1/15
Harvest Date: 10/30/15
Population: 32,000
Row Spacing (in.) 30
Hybrid: Pioneer 1690 CHR
Reps: 6
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 1 qt/ac Glyphosate and 2 qt/ac Volley ATZ on 5/3/15 (Burndown) ***Post:*** 1.5 qt/ac Glyphosate on 6/21/15
Seed Treatment: Unknown
Foliar Insecticides: None
Foliar Fungicides: None
Irrigation: SDI, Total: 6.81"
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N mangement.

Grower Nitrogen Treatment: The grower initial N rate was 75 lbs N/acre applied at planting. A side dress rate of 205 lbs N/acre was applied. Total grower N application was 280 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips 75 lbs N/acre were applied at planting and early in the season. The 75 lb N/acre was on by 6/10/15. Crop canopy sensing and application occurred on 6/22/15 at the V8 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 74 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 209 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

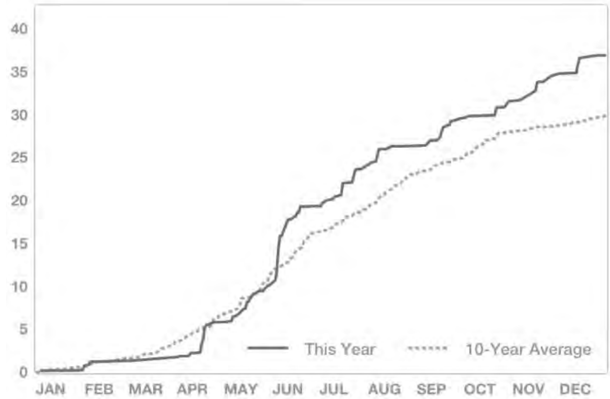
	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	280	238 A*	48 B	1.16 A	$686.70
Project SENSE N Management	149	226 B	86 A	0.66 B	$728.05
P-Value	N/A	0.0244	0.0002	<.0001	N/A

†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 131 lb/acre lower than the grower's N application. Yield was significantly lower for the Project SENSE treatment (12 bu/ac). Partial Factor Productivity of N was higher for the Project SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year because N savings outweighed the loss in yield. Since this is a sub-surface drip irrigation site, N applied on 6/22/15 likely was not incorporated until a July 2 rainfall event of ~0.60".

Project SENSE (Sensor-based In-season N Management)

Study ID: 214001201501
County: Adams
Soil Type: Hersh fine sandy loam; Kenesaw silt loam;
Planting Date: unknown
Harvest Date: 10/15/15
Population: unknown
Row Spacing (in.) 30
Hybrid: unknown
Reps: 6
Previous Crop: Hailed soybeans, then cover crop
Tillage: Unknown
Herbicides: ***Pre:*** Unknown ***Post:*** Unknown
Seed Treatment: unknown
Foliar Insecticides: Unknown
Foliar Fungicides: Unknown
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction:

This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 34 lbs N/acre applied at planting. A side-dress rate of 140 lbs N/acre was applied. Total grower N application was 174 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 34 lbs N/acre were applied at planting with an additional 41 lbs N/acre added on 6/9/15 to bring the base rate to 75 lb N/acre. Crop canopy sensing and application occurred on 6/30/15 at the V9 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 89 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 204 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

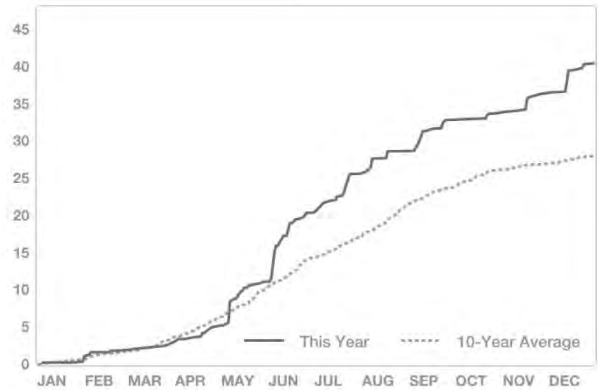
	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	174	254 A*	82 A	0.68 A	$814.00
Project SENSE N Management	164	252 A	86 A	0.66 A	$813.20
P-Value	N/A	0.6515	0.4013	0.5340	N/A

†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 10 lb/acre lower than the grower's N application. There was no yield difference between the two treatments. Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return was $1/acre lower the Project SENSE treatment when looking at average yield and N applied.

Project SENSE (Sensor-based In-season N Management)

Study ID: 213035201501
County: Clay
Soil Type: Hord silt loam; Hastings silty clay loam; Crete silt loam;
Planting Date: 5/1/15
Harvest Date: 10/13/15
Population: 33,000
Row Spacing (in.) 30
Hybrid: unknown
Reps: 5, One rep was removed due to compaction from pivot work in this area.
Previous Crop: Corn
Tillage: Reduced Tillage
Herbicides: ***Pre:*** unknown ***Post:*** unknown
Seed Treatment: unknown
Foliar Insecticides: unknown
Foliar Fungicides: unknown
Note: Irrigation water nitrate: 8.9 ppm
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: 268 lbs N/acre was applied at or prior to planting.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 108 lbs N/acre were applied at planting. Crop canopy sensing and application occurred on 6/23/15 at the V10 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 76 lbs N/acre with a minimum rate of 31 lbs N/acre, and maximum rate of 299 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return ($/ac)‡
Grower N Management	268	249 A*	52 B	1.08 A	734.65
Project SENSE N Management	179	227 B	73 A	0.77 B	741.40
P-Value	N/A	0.0165	0.0008	0.0002	N/A

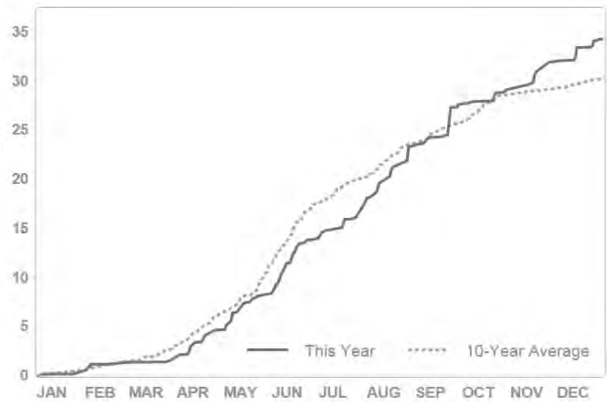
†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 84 lb/acre lower than the grower's N application. Yield was significantly lower for the Project SENSE treatment (20 bu/ac). Partial Factor Productivity of N was higher for the Project SENSE N treatment. Marginal net return for the SENSE treatment this year resulted in a loss of $18.40/ac compared to the grower treatment.

Project SENSE (Sensor-based In-season N Management)

Study ID: 200125201501
County: Nance
Soil Type: Ortello fine sandy loam; Hord fine sandy loam;
Planting Date: 5/6/15
Harvest Date: 10/30/15
Population: 32,000
Row Spacing (in.) 30
Hybrid: unknown
Reps: 6
Previous Crop: Corn
Tillage: No-Till
Seed Treatment: unknown
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Note: 0-36" soil sample taken after 2014 crop for nitrates were 4.1 ppm and 7.3 ppm (average was used for NRD N recommendation).
Irrigation water nitrate: 12.3 ppm.
Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 45 lbs N/acre and was applied at planting. A side-dress rate of 106 lbs N/acre was applied. Total N applied was 151 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 45 lbs N/acre was applied at planting with another 30 lbs N/acre applied at sidedress. Crop canopy sensing and application occurred on 7/1/15 at the V10 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 48 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 209 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lb N/ bu grain	Marginal net return ($/ac)‡
Grower N Management	151	212 A*	78 B	0.71 A	675.65
Project SENSE N Management	123	213 A	97 A	0.58 B	697.50
P-Value	N/A	0.6916	0.0009	0.0003	N/A

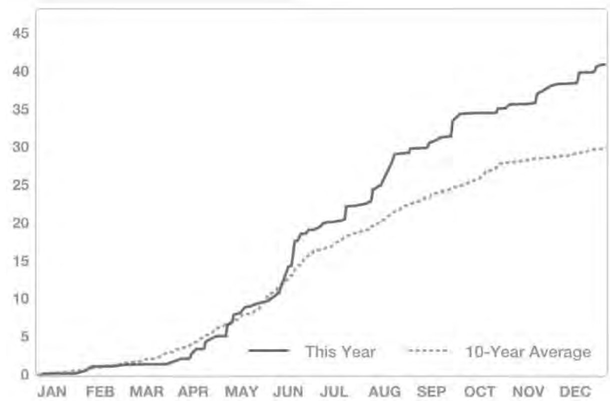
†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 28 lb/acre lower than the grower's N application. There was no statistical difference in yield between the two treatments. Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year due to saved N with no yield penalty.

Project SENSE (Sensor-based In-season N Management)

Study ID: 201141201501
County: Platte
Soil Type: Valentine fine sand; Thurman loamy fine sand; Blendon fine sandy loam; Valentine-Thurman complex;
Planting Date: unknown
Harvest Date: 10/21/15
Population: unknown
Row Spacing (in.) 30
Hybrid: unknown
Reps: 5
Previous Crop: Hailed out corn, planted soybeans late
Tillage: No-Till
Herbicides: ***Pre:*** unknown ***Post:*** unknown
Seed Treatment: unknown
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Note: 0-36" soil nitrate sample after 2014 crop had 1.5 and 3 ppm (average was used for NRD N rec).
Irrigation water nitrate: 28.8 ppm
Irrigation: Pivot, Total: 10.3
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 50 lbs N/acre and was applied at planting. A side-dress rate of 100 lbs N/acre was applied. Total N applied was 150 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 30 lbs N/acre was applied at planting and another 46 lb/ac in two subsequent sidedress applications. Crop canopy sensing and application occurred on 7/13/15 at the VT growth stage. Across all project SENSE treatments, the average N rate applied in-season was 88 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 230 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	150	179 A*	67 A	0.84 B	$555.85
Project SENSE N Management	164	171 B	59 B	0.96 A	$517.55
P-Value	N/A	0.0473	0.0203	0.0352	N/A

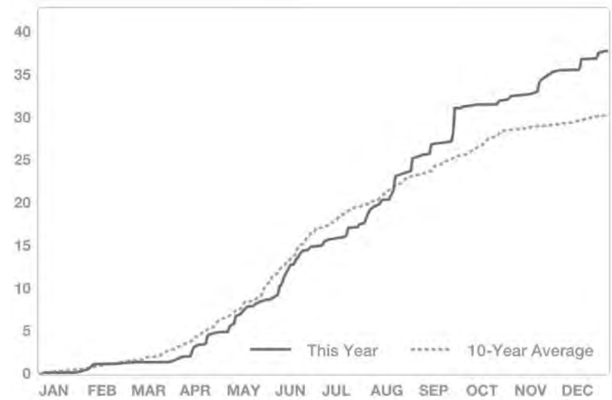
†Wet bushels per acre. Moisture data not available to correct to standard moisture.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.
*Values with the same letter are not significantly different at a 95% confidence level.

Summary: At this site, the Project SENSE N application was 14 lb/acre higher than the grower's N application. Yield was significantly lower for the Project SENSE treatment (9 bu/ac). Partial Factor Productivity of N was higher for the grower N treatment. Marginal net return looking at grain and N prices resulted in a loss in profit for the SENSE treatments due to lost yield. At this site, Project SENSE N application did not occur until near VT; this resulted in only 75 lb N/acre being available to the crop for much of the growing season.

Project SENSE (Sensor-based In-season N Management)

Study ID: 021125201501
County: Nance
Soil Type: Thurman loamy fine sand; Thurman-Ortello fine sandy loam; Loretto-Thurman complex;
Planting Date: 5/7/15
Harvest Date: 11/5/15
Population: 29,500
Row Spacing (in.) 30
Hybrid: Dekalb 62-97
Reps: 6
Previous Crop: Soybean
Tillage: No-till
Herbicides: ***Pre:*** Bicep and Roundup ***Post:*** Unknown
Seed Treatment: Poncho VOTiVO
Foliar Insecticides: Unknown
Foliar Fungicides: Headline AMP

Note: 0-36" Soil nitrate sample after 2014 crop was 6 ppm
Irrigation Water Nitrate: 13.5 ppm
Irrigation: Pivot, Total: 6.4
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 9 lbs N/acre applied at planting. Following planting 70 lbs N/acre was applied. A side-dress rate of 90 lbs N/acre was applied. Total grower N application was 169 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 79 lbs N/acre was applied at or near planting. Crop canopy sensing and application occurred on 7/1/15 at the V10 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 83 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 262 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	169	238 A*	79 B	0.70 A	$758.85
Project SENSE N Management	162	240 A	83 A	0.68 B	$770.70
P-Value	N/A	0.2903	0.0204	0.0174	N/A

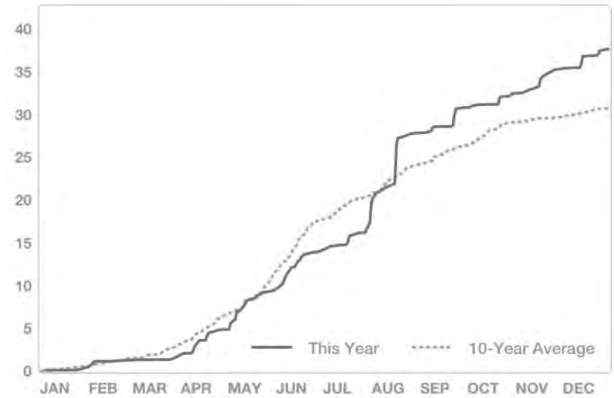
†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 7 lb/acre lower than the grower's N application. There was no yield difference between the two treatments. Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year due to saved N with no yield penalty.

Project SENSE (Sensor-based In-season N Management)

Study ID: 202125201501
County: Nance
Soil Type: Hord very fine sandy loam; Detroit silt loam; Loretto-Thurman complex; Nora-Crofton complex;
Planting Date: 4/28/15
Harvest Date: 10/30/15
Population: 34,000
Row Spacing (in.) 30
Hybrid: Unknown
Reps: 6
Previous Crop: Soybean
Tillage: Strip-till

Note: 0-36" soil nitrate sample after 2014 crop had 6.2 ppm.
Irrigation water nitrate: N/A – river water
Irrigation: Pivot, Total: 9.3
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: In a strip-till operation prior to planting 45 lb N/ac was applied (13 gal 32% + 2 gal/ac Thiosulfate). The grower initial N rate was 45 lbs N/ac and was applied at planting. A side dress rate of 185 lbs N/acre was applied (52 gal/ac 32%). These application brought the total to 230 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 49 lb N/ac was applied in a strip-till operation prior to planting and an additional 53 lb N/ac (15 gal 32%) was applied at sidedress. This brought the base rate to 98 lb N/ac prior to crop sensing. Crop canopy sensing and application occurred on 7/1/15 at the V11 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 69 lbs N/acre with a minimum of 30 lbs N/acre and maximum of 294 lbs N/ac.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return ($/ac)‡
Grower N	230	243 A*	59 B	0.95 A	737.45
Project SENSE N	167	237 A	81 A	0.71 B	756.50
P-Value	N/A	0.3460	0.0067	0.0031	N/A

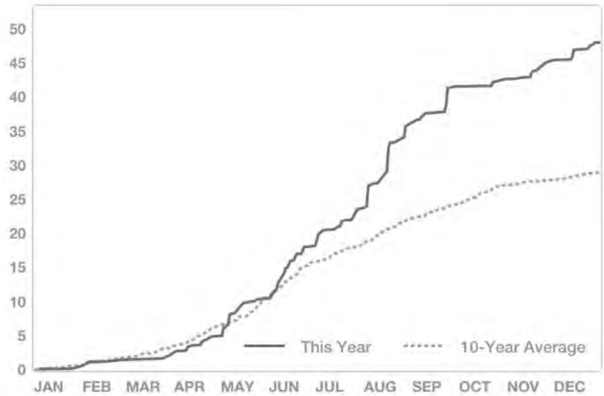
†Wet bushels per acre. Moisture data not available to correct to standard moisture. Yield data is from yield monitor and was not cleaned.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65 corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 55 lb/acre lower than the grower's N application. There was no statistical difference in yield between the two treatments. Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year.

Project SENSE (Sensor-based In-season N Management)

Study ID: 211023201501
County: Butler
Soil Type: Muir silt loam; Zook silt loam; Gibbon silty clay loam; Ovina-Thurman complex;
Planting Date: 4/28/15
Harvest Date: 11/5/15
Population: 32,000
Row Spacing (in.) 30
Hybrid: Mycogen 2V709
Reps: 6
Previous Crop: Soybean
Tillage: Ridge Till
Herbicides: ***Pre:*** Surestart ***Post:*** Durango
Seed Treatment: CruiserMax 250
Foliar Insecticides: None
Foliar Fungicides: None

Note: Irrigation water nitrate: 30 ppm
Irrigation: Pivot, Total: 4"
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N mangement.

Grower Nitrogen Treatment: The grower initial N rate was 91 lbs N/acre applied at planting. A side-dress rate of 106 lbs N/acre was applied on 6/9/15. Total grower N application was 197 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 91 lbs N/acre were applied at planting. Crop canopy sensing and application occurred on 7/1/15 at the V12 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 62 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 127 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	198	212 A*	60 B	0.93 A	$645.10
Project SENSE N Management	153	207 B	76 A	0.73 B	$656.10
P-Value	N/A	0.0388	0.0002	<.0001	N/A

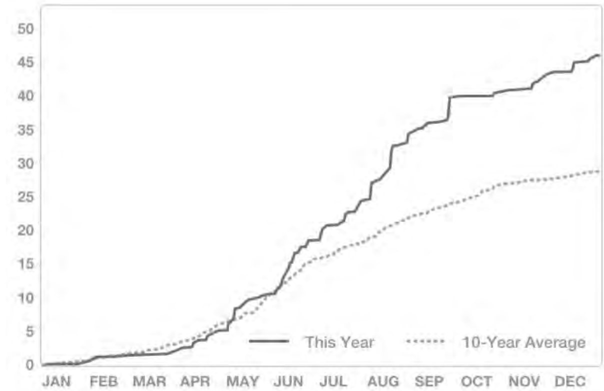
†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 45 lb/acre lower than the grower's N application. Yield was significantly lower for the Project SENSE treatment (4 bu/ac). Partial Factor Productivity of N was higher for the Project SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year because N savings outweighed the loss in yield.

Project SENSE (Sensor-based In-season N Management)

Study ID: 212023201501
County: Butler
Soil Type: Thurman loamy fine sand; Gibbon silty clay loam;
Planting Date: 4/16/15
Harvest Date: 11/4/15
Population: 34,000
Row Spacing (in.) 30
Hybrid: Mycogen 2C799
Reps: 6
Previous Crop: Corn
Tillage: Ridge-Till
Herbicides: ***Pre:*** Surestart ***Post:*** Durango
Seed Treatment: CruiserMax 250
Foliar Insecticides: None
Foliar Fungicides: None

Note: Irrigation water nitrate: 28.8 ppm
Irrigation: Pivot, Total: 1”
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N mangement.

Grower Nitrogen Treatment: The grower initial N rate was 91 lbs N/acre applied at planting. A side-dress rate of 106 lbs N/acre was applied on 6/9/15. Total grower N application was 197 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 91 lbs N/acre were applied at planting. Crop canopy sensing and application occurred on 7/1/15 at the V10 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 74 lbs N/acre with a minimum rate of 31 lbs N/acre, and maximum rate of 214 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher’s LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	197	178 A*	51 A	1.11 A	$521.65
Project SENSE N Management	165	158 B	54 A	1.05 A	$469.45
P-Value	N/A	0.0010	0.0747	0.0960	N/A

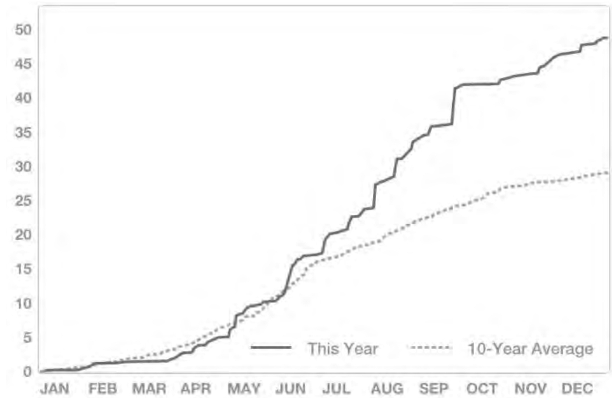
†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 32 lb/acre lower than the grower's N application. This resulted in a statistically significant yield loss (20 bu/ac). Partial Factor Productivity of N was not different between the two treatments. Marginal net return for the SENSE treatment this year resulted in a loss of $52.20/acre compared to the grower treatment.

Project SENSE (Sensor-based In-season N Management)

Study ID: 210037201501
County: Colfax
Soil Type: Lawet silt loam;
Planting Date: 5/5/15
Harvest Date: 11/1/15
Population: 32,000
Row Spacing (in.)
Hybrid: GO7B39 3111A
Reps: 6
Previous Crop: Corn
Tillage: Minimum Till
Herbicides: ***Pre:*** LexarEZ ***Post:*** HalexGT
Seed Treatment: Avicta Complete Corn (A500)
Foliar Insecticides: ForceCS at planting
Foliar Fungicides: QuiltXL

Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 75 lbs N/acre applied at planting. A side-dress rate of 123 lbs N/acre was applied on 6/22/15. Total grower N application was 198 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 75 lbs N/acre were applied at planting. Crop canopy sensing and application occurred on 7/10/15 at the V12 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 72 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 227 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

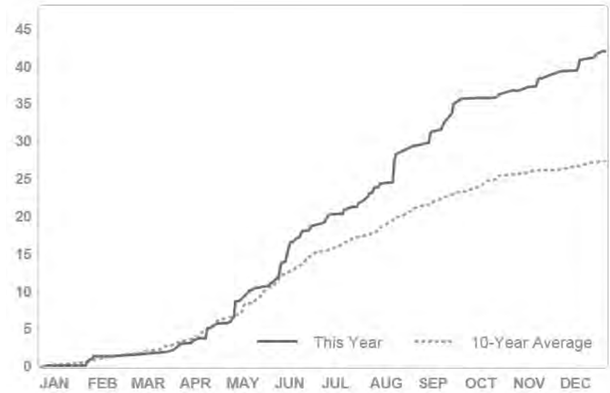
	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	198	207 A*	58 B	0.96 A	$626.85
Project SENSE N Management	147	201 B	76 A	0.74 B	$638.10
P-Value	N/A	0.0031	0.0007	<.0001	N/A

†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 51 lb/acre lower than the grower's N application. Yield was significantly lower for the Project SENSE treatment (6 bu/ac). Partial Factor Productivity of N was higher for the Project SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year because N savings outweighed the loss in yield.

Project SENSE (Sensor-based In-season N Management)

Study ID: 204159201501
County: Seward
Soil Type: Hastings silt loam; Hastings silty clay loam;
Planting Date: 4/28/15
Harvest Date: 10/27/15
Population: 34,000
Row Spacing (in.) 30
Hybrid: Pioneer 1690
Reps: 6
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** Corvus ***Post:*** Roundup PowerMax
Seed Treatment: Pioneer Standard Rate with Poncho PPST 250
Foliar Insecticides: None
Foliar Fungicides: Aproach Prima
Irrigation: Pivot, Total: 4.80”
Rainfall (in.):



Introduction:

This study compares crop canopy sensor based in-season N application to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 25 lbs N/acre applied at planting. A side dress rate of 175lbs N/acre was applied on 7/5/15. Total grower N application was 200 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 25 lbs N/acre were applied at planting with an additional 50 lbs N/acre added on 6/10/15. Crop canopy sensing and application occurred on 7/8/15 at the V12 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 61 lbs N/acre with a minimum rate of 30 lbs N/acre, and maximum rate of 194 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher’s LSD.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	200	243 A*	68 B	0.81 A	$756.95
Project SENSE N Management	136	232 B	95 A	0.58 B	$758.40
P-Value	N/A	0.0008	<.0001	<.0001	N/A

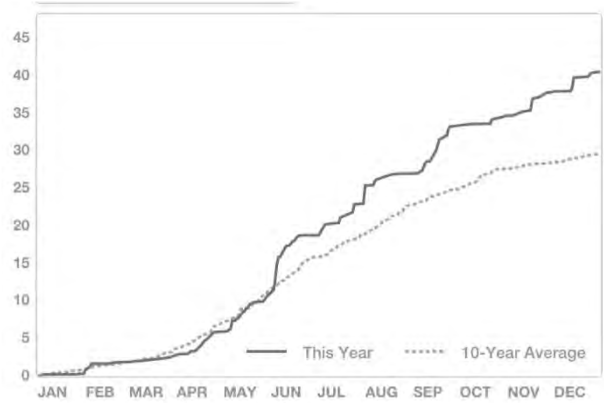
†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, the Project SENSE N application was 64 lb/acre lower than the grower's N application. This resulted in a statistically significant yield loss (11 bu/ac). Partial Factor Productivity of N was higher for the SENSE N treatment. Marginal net return looking at grain and N prices was favorable for the SENSE treatment this year due to greater monetary return for saved N than monetary loss for reduced yield.

In-Season Nitrogen with Crop Canopy Sensor vs Maize-N Model vs Grower Rate

Study ID: 049081201501
County: Hamilton
Soil Type: Hastings silt loam;
Planting Date: 5/4/2015
Harvest Date: 10/29/15
Population: 32,500
Row Spacing (in.) 30
Hybrid: Golden Harvest (ent) E116K4
Reps: 6
Previous Crop: Corn
Tillage: Ridge-Till
Herbicides: ***Pre:*** Lexar EZ on 5/4/15 (planting) ***Post:*** Unknown
Seed Treatment: Unknown
Foliar Insecticides: Unknown
Foliar Fungicides: Quilt XL 10.5 - 14 fl.oz at brown silk (End of July first week of August)

Note: Lodging occurred in August
High winds occurred September 3 and 4th
Hail event occurred September 9th
Irrigation: Pivot, Total: Unknown
Rainfall (in.):



Introduction: This study compares crop canopy sensor based in-season N application to Maize-N model in-season N recommendation to the grower's standard N management.

Grower Nitrogen Treatment: The grower initial N rate was 45 lbs N/acre applied at planting. A side-dress rate of 150 lbs N/acre was applied on 6/19/15. Total grower N application was 195 lbs N/acre.

Maize-N Nitrogen Treatment: (Maize-N is a nitrogen recommendation model developed at the University of Nebraska-Lincoln. The user inputs information on the current corn crop, last season crop, tillage, crop residue management, basic soil properties, fertilizer management, and long-term weather data of the field.) For the Maize-N treatment, 45 lbs N/acre were applied at planting. A side-dress rate of 187 lbs N/acre was applied on 6/19/15. Total Maize N application was 232 lbs N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 45 lbs N/acre were applied at planting with an additional 30 lb N/ac added on 6/2/15. Crop canopy sensing and application occurred on 7/2/15 at the V10 growth stage. Across all project SENSE treatments, the average N rate applied in-season was 93 lbs N/acre with a minimum rate of 31 lbs N/acre, and maximum rate of 298 lbs N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

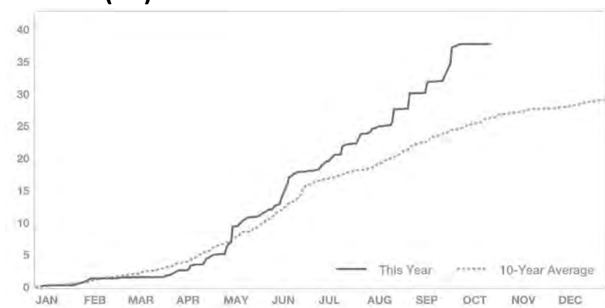
	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (PFPn)	lbs N/ bu grain	Marginal Net Return‡
Grower N Management	195	197 A	57 B	0.99 B	$592.30
Project SENSE N Management	168	204 A	68 A	0.82 C	$635.40
Maize-N Nitrogen Rate	232	201 A	49 C	1.15 A	$582.85
P-Value	*N/A*	*0.1624*	*<.0001*	*<.0001*	*N/A*

†Wet bushels per acre. Moisture data not available to correct to standard moisture.
*Values with the same letter are not significantly different at a 95% confidence level.
‡Marginal net return based on $3.65/bu corn and $0.65/lb N fertilizer. Cost of applicator and equipment is not included in this calculation.

Summary: At this site, Project SENSE N application was 27 lb/acre lower than the grower's N application. There was no significant difference in yield between the three N recommendation approaches. Partial Factor Productivity of N was highest for the Project SENSE N treatment. Project SENSE N management maximized net returns.

Maize-N Nitrogen Sidedress Rate

Study ID: 004053201501
County: Dodge
Soil Type: Alcester silty clay loam; Moody silty clay loam; Moody-Alcester silty clay loam;
Planting Date: 4/30/15
Harvest Date: 10/28/15
Population: 27,500
Row Spacing (in.) 30
Hybrid: Within each treatment is two different hybrids (Hoegemeyer 8345 and 8066)
Reps: 3
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 2.0 qts/ac Keystone LA (atrazine & acetochlor at planting 4/30/15. ***Post:*** 0.5 oz/ac Armezon, 1 pt/ac Atrazine, and 32 oz/ac Roundup Powermax on 6/8/15.
Seed Treatment: Poncho 1250
Foliar Insecticides: Capture LFR 3 oz/ac on April 30 (at planting).
Foliar Fungicides: 10.5 oz/ac Quilt Xcel with Hagie sprayer (volume of 18 gallon/ac) on 7/15/15.
Fertilizer: 110 lb/ac MAP, fall applied. 5 gal/ac 10-34-0 with planter 4/30/15. 20 gal/ac 32% UAN and 3 gal/ac 12-0-0-26 with sprayer on 4/30/15.
Note: Wet Year
Irrigation: None, Total: 0"
Rainfall (in.):



Introduction: Maize-N is a nitrogen recommendation model developed at the University of Nebraska-Lincoln. The user inputs information on the current corn crop, last season crop, tillage, crop residue management, basic soil properties, fertilizer management, and long-term weather data of the field. The Maize-N program was run on June 11, 2015, and weather events up to that week were included in the calculations for in-season sidedress rate. The program generated an attainable yield of 210 bu/ac for this field on June 11, 2015. The grower had already applied 84 lb N/ac at planting. The model calculated in-season N recommendation at 63 lb N/ac. To test this recommendation, two treatments of N were used: the Maize-N rate (20 gallons/ac 32% UAN) and the Maize-N rate + 30 lb N/ac (28.5 gallons/acre 32% UAN). Treatments were applied on June 24.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD. There was no interaction between hybrid and nitrogen rate (N rate x hybrid P=0.5487), therefore these factors are reported separately.

Hybrid	Yield (bu/ac)†	Marginal Net Return ($/ac)‡
Hoegemeyer 8345	222 A	810.30
Hoegemeyer 8066	221 A	800.12
P-Value	0.8309	N/A
N Rate		
Maize-N Sidedress Rate	222 A	775.30
Maize-N Sidedress Rate + 30	221 A*	756.65
P-Value	0.4919	N/A

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 15.5% moisture.
‡Net return based on $3.65/bu corn price, $0.49/lb N fertilizer price, $19/unit price difference between the 2 hybrids (8066 cost more).

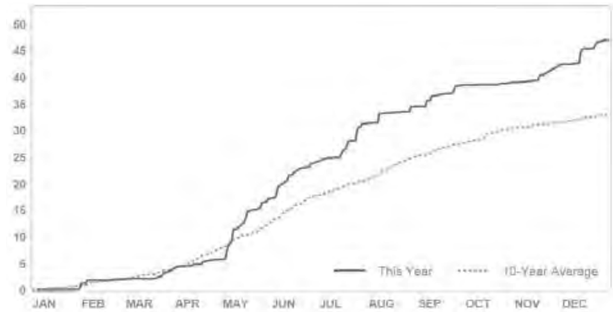
Summary: There was no significant difference between Hoegemeyer 8345 and Hoegemeyer 8066 or between the Maize-N rate and Maize-N + 30 rate. The Maize-N treatment resulted in yields that were not different than Maize-N + 30 lb/acre and therefore had a higher net return.

Nitrogen Sidedress to Simulate Aerial N Application

Study ID: 215127201501
County: Nemaha
Soil Type: Wymore silty clay loam;
Planting Date: 04/25/15
Harvest Date: Unknown
Population: 24,400
Row Spacing (in.) 30
Hybrid: Fontanelle 156893
Reps: 4
Previous Crop: Unknown
Tillage: No-Till
Herbicides: ***Pre:*** Sure Start and 1 lb/ac Atrazine ***Post:*** Glyphosate
Seed Treatment: Unknown
Foliar Insecticides: None
Foliar Fungicides: 10.5 oz Quilt XL with Franchise surfactant on 8/10/15

Fertilizer: 60 lbs/ac P - Fall applied;
130 lbs/ac N (liquid), 1 lb/ac Zinc and 10 lb/ac Sulfur - Spring, pre-plant;
Foliar nutrient applied on 6/10/15

Irrigation: None, Total:
Rainfall (in.):



Introduction: This study is evaluating mid-season nitrogen application to nitrogen deficient corn. Heavy spring rains in 2015 resulted in nitrogen deficiency symptoms in corn. Previous on-farm research conducted in Nebraska in 2013 and 2014 and in Missouri in previous years indicated mid-season nitrogen application may be economically feasible. In Northwest Missouri in 2013, local ag suppliers were flying on urea to nitrogen deficient corn fields. This experiment was conducted to test the feasibility of this management practice. Dry urea (46-0-0) was applied on Aug. 8 at R1 at rates of 0, 50, 75, and 100 lbs N/ac. According to radar interpolated estimates, the next measurable rainfall at this location was on Aug. 27 and totaled 0.92 inches. This method simulated nitrogen being top-dressed with a high clearance ground applicator or aerial application. The experiment was designed as a randomized complete block design with 4 replications These plots were 25’ x 15’ (6 30" rows) located on-farm. At harvest, the 2 middle rows (5’ x 15’) were hand-harvested. Corn was shelled, tested for moisture and yields were calculated on a 15.5% moisture basis.

Results: Data were analyzed using the GLM and REG procedures in SAS 9.4 (SAS Institute Inc., Cary, NC).

Stand count was tested as a covariate with yield to check if plant number influenced yield. Stand counts were not significant indicating that plant numbers did not influence yield. Yield had a significant linear response to N rate (p=0.0215) (Figure 1). Additional N rates are needed to determine at what N rate yield plateaus. At $0.51/lb N fertilizer, an application cost of $9.50/ac and $3.65/bu corn price, each additional pound of N applied would result in an increase in yield of $3.72/ac.

N Rate (lb/ac)	Harvest Stand Count (plant/ac)
0	23946 A
50	26268 A
75	22640 A
100	25252 A
P-Value	0.1142

*Values with the same letter are not significantly different at a 90% confidence level.

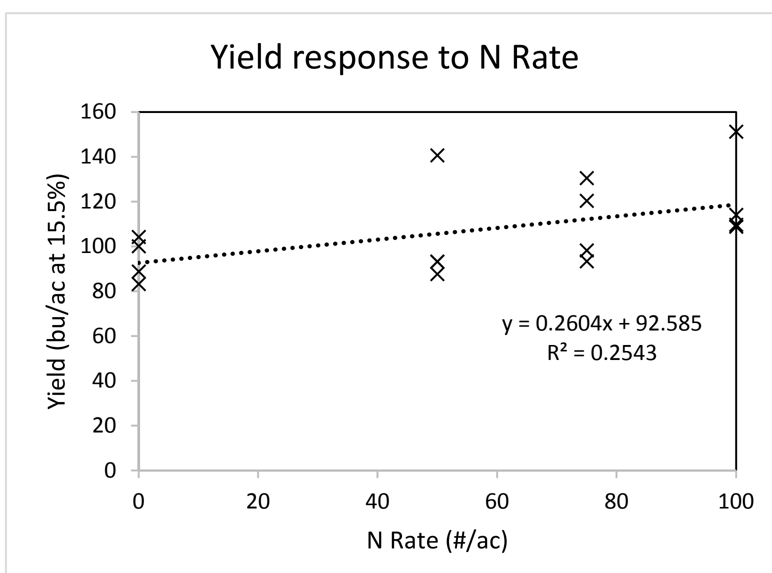


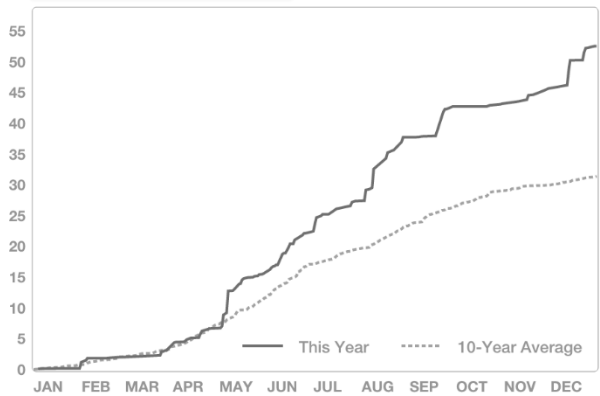
Figure 1: Linear relationship between corn yield and mid-season nitrogen rate.

Starter Fertilizer on Rainfed Corn

Study ID: 001155201501
County: Saunders
Soil Type: Yutan, eroded - Aksarben silty clay loam; Judson silt loam
Planting Date: 4/15/15
Harvest Date: 9/30/15
Population: 28,500
Row Spacing (in.) 30
Hybrid: LG 5622 VT2 RIB
Reps: 9
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** Corvus - behind planter ***Post:*** 1 qt/ac Roundup PowerMax
Seed Treatment: Poncho/Votivo
Foliar Insecticides: none
Foliar Fungicides: none

Fertilizer: 130 lbs/ac fall applied anhydrous, 10 gal/ac UAN 32%, and 2 gal/ac liquid thiosol

Irrigation: None, Total: N/A
Rainfall (in.):



Introduction: This study is a continuation of a similar effort conducted in 2013 and 2014, looking at different starter fertilizer products. The purpose of this study was to try to answer the question, "Does applying starter fertilizer at planting impact rainfed corn yields?" At planting 5 gal/acre of 6-24-6 was applied in-furrow, placed below the seed.

Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count	Marginal Net Return ($/ac)‡
Check	239 A*	21.4 A	27,233 A	$872.35
6-24-6 starter (5 gal/ac)	241 A	20.6 B	27,382 A	$861.15
P-Value	0.1377	<0.0001	0.6554	N/A

†Yield data from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net return based on $3.65/bu corn and $3.70/gal starter fertilizer cost.

Summary: There was a visual difference between the check and starter treated corn early in the growing season (starter treated crop appeared darker green) as shown in Figure 1. The starter fertilizer application did not result in an increased yield. The check had higher grain moisture at harvest. There was no difference in stand counts at harvest. No soil tests were available for this field.

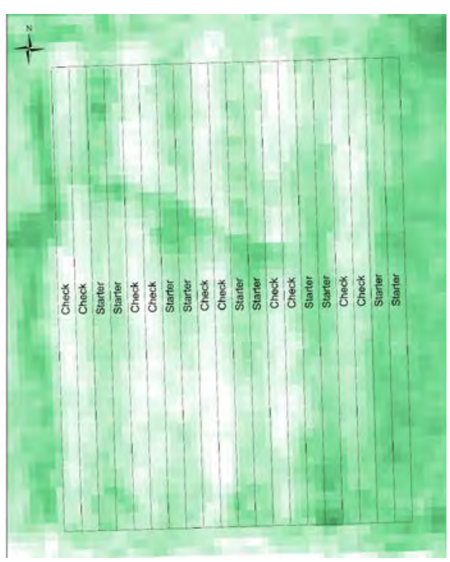
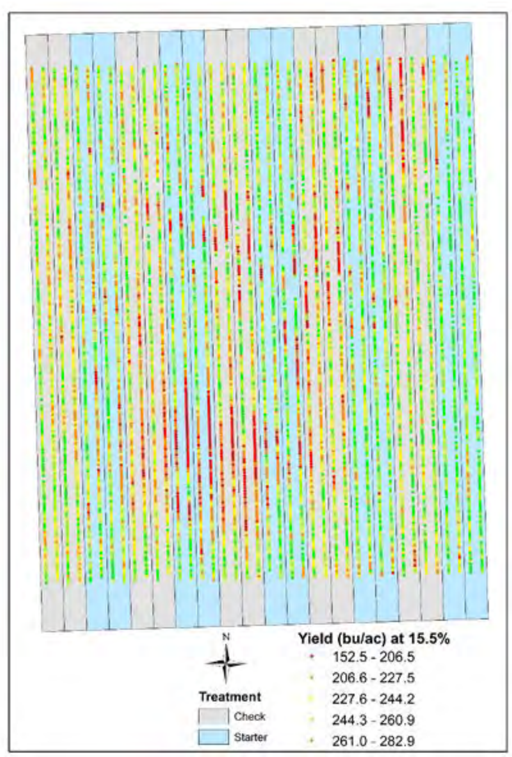


Figure 1: Satellite imagery from mid-June, 2015 from FarmLogs (http://farmlogs.com).

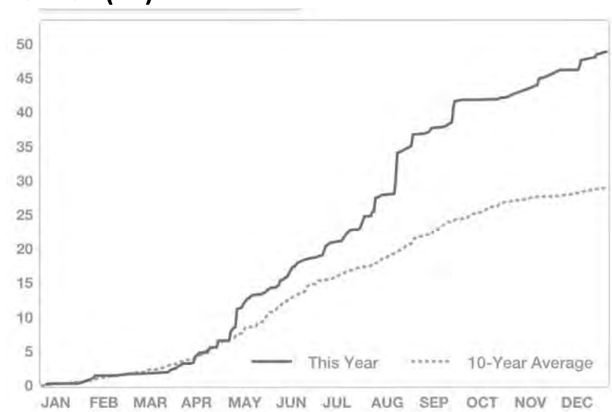


Nachurs® Starter Fertilizer on Soybeans

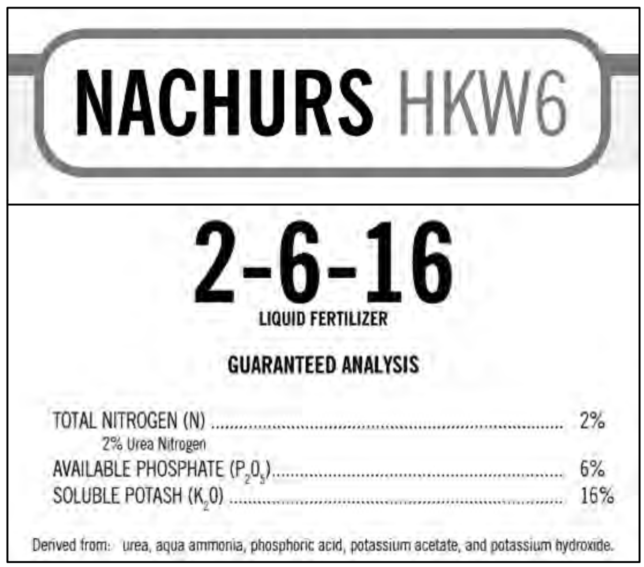
Study ID: 007155201502
County: Saunders
Soil Type: Yutan silty clay loam; Judson silty clay loam;
Planting Date: 5/22/15
Harvest Date: 10/22/15
Population: 140,000
Row Spacing (in.) 15
Hybrid: 2607R2
Reps: 9
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** Valor XLT, 2,4-D, Roundup, and AMS ***Post:*** Roundup, AMS, Targa, and Fomesafen
Seed Treatment: Acceleron Fungicide
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Fertilizer: None

Irrigation: None, Total: N/A
Rainfall (in.):



Introduction: In this study, the grower looked at the effect of Nachurs® HKW6 starter product on soybean yield and economics compared to an untreated check. The product was applied at a rate of 3 gal/ac in-furrow. Product information is shown at right.



Product information from:
http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CNACHURS_HKW6_2_6_16_9_2_2014_1_52_40_PM.pdf

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Check	67 A*	10.3 A	596.30
Nachurs (3 gal/ac)	67 A	10.3 A	579.35
P-Value	0.5087	0.4468	N/A

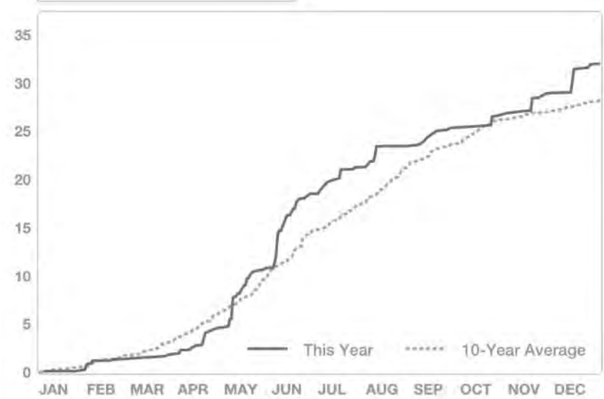
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $16.95/acre Nachurs fertilizer cost.

Summary: There was no statistical yield or moisture difference for using the Nachurs® HKW6 starter compared to the check.

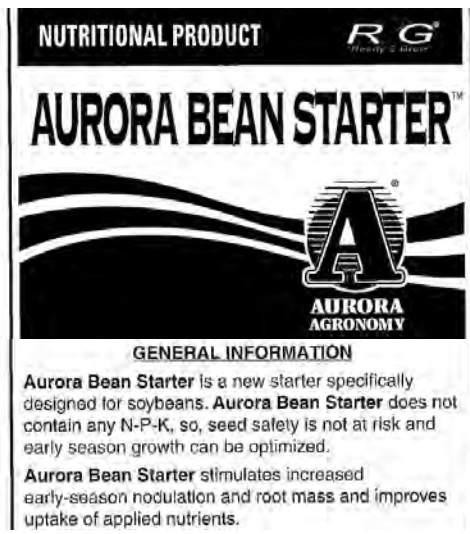
Aurora Bean Starter™ Application on Soybeans

Study ID: 038035201502
County: Clay
Soil Type: Crete silt loam;
Planting Date: 5/2/15
Harvest Date: 9/15/15
Population: 195,000
Row Spacing (in.) 15
Hybrid: Asgrow 24-31
Reps: 6
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** Roundup PowerMax ***Post:*** Roundup PowerMax
Seed Treatment: Not specified (Standard)
Foliar Insecticides: 3 lbs sugar applied at R1
Foliar Fungicides: Unknown
Fertilizer: 45 lbs/ac P, 2 lbs/ac Zn, 15 lbs/ac S (fall applied)

Note: Some shattering on this field prior to harvest due to hail event Sept. 13. Estimated 5-6 bpa on the ground.
Irrigation: Pivot, Total: 3.65"
Rainfall (in.):



Introduction: In this study the grower looked at the effect of Aurora Bean Starter™ on soybean yield and economics compared to an untreated check. Product information is at right. The Aurora Bean Starter™ product was applied at a rate of 1 gal/ac, in-furrow at planting. Soybeans were drilled in 15" rows.



Results:

	Yield (bu/ac)†	Moisture (%)	Test Weight	Marginal Net Return ($/ac)‡
Check	79 A*	9.4 A	58 A	703.01
Aurora Bean Starter 1 gal./ac	79 A	9.6 A	57 A	693.10
P-Value	0.8438	0.2022	0.1747	N/A

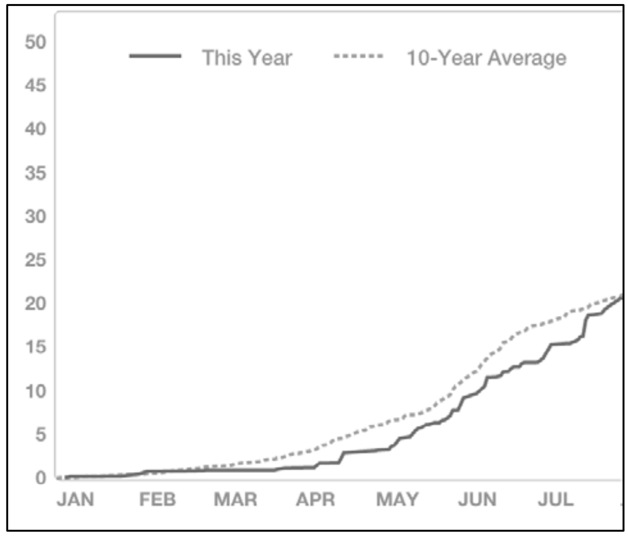
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $10.00/acre starter fertilizer cost.

Summary: There was no statistical difference in soybean yield, moisture, stand counts, or test weight for the starter fertilizer compared to the untreated check.

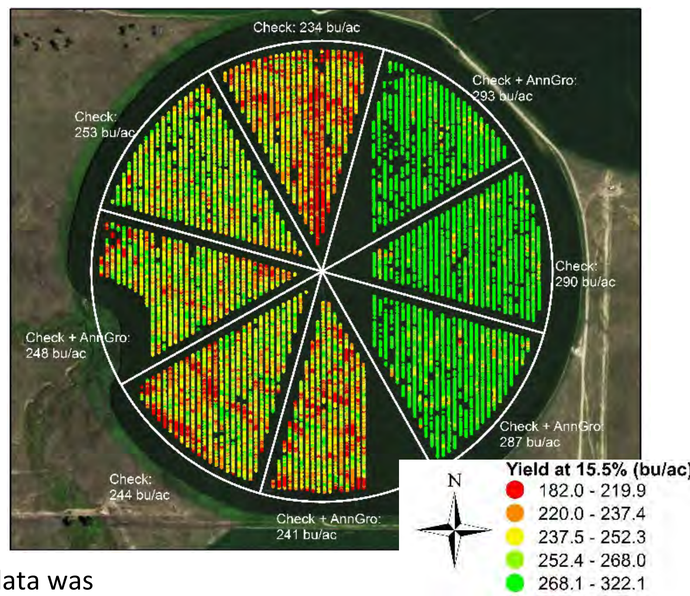
AnnGro Additive with UAN through Pivot

Study ID: 005015201501
County: Boyd
Soil Type: Simeon loamy sand; Simeon-Valentine loamy sand; Dunday loamy fine sand;
Planting Date: 4/29/2015
Harvest Date: 10/10/15 and 11/12/15
Population: 35,000
Row Spacing (in.) 30
Hybrid: DKC 62-97VT3P
Reps: 4
Previous Crop: Corn
Tillage: Strip-till
Herbicides: ***Pre:*** unknown ***Post:*** 2.5 qts/ac Fultime, 32 oz/ac Durango
Seed Treatment: Acceleron and Poncho 250
Foliar Insecticides: Sniper 3 oz/ac on 7/30
Foliar Fungicides: none
Fertilizer: DAP, Potash VRA on 4/10/15. 15gal/ac 22-5-0-8, 3.5 gal/ac 7-22-6-0-2.5-1(Zn) on 4/29. 25 lbs/ac N and 6 lbs/ac S through pivot on 6/6, 6/15, 6/28, 7/1, 7/6, and 7/20. 30 lbs/ac N on 7/30.

Irrigation: Pivot, Total: unknown
Rainfall (in.): Note: Rainfall data only available through July at this location.



Introduction: AnnGro® -EW Fertilizer Additive (ANNGRO USA) is a bio-based product which claims enhancement in uptake and transport of plant nutrients. The objective of this study is to evaluate the effects of AnnGro® -EW Fertilizer Additive applied with UAN and Thiosulfate fertilizer versus UAN and Thiosulfate fertilizer with no AnnGro® -EW Fertilizer Additive. UAN was applied through a center pivot at a rate of 7 gpa. AnnGro® -EW was applied at 1 L per ton of UAN and was applied through the pivot on 7/6/15 and 7/20/15 to the selected pie sections.



Note: At this location, part of the field was inadvertently harvested earlier (10/10/15) as wet corn (east part of field), while the remainder was harvested on 11/12/15 as dry corn. For analysis, yield data was removed so that only yield data from the harvest date that comprised the greatest area in each pie wedge remained in each treatment area. The statistical analysis then used a nested replication term to account for the harvest dates. Data was analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). This product is not commercially available, therefore marginal net return is not included in the results.

Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count
Check - UAN 32% and Thiosulfate	269 A*	21.4 A	30,284 A
AnnGro in Solution with UAN 32% and Thiosulfate	265 B	21.4 A	29,808 B
P-Value	0.0331	0.8378	0.0540

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.

Summary: The addition of AnnGro® -EW did not increase corn yields, grain moisture, or harvest stand counts when compared to the check treatment (UAN and thiosulfate).

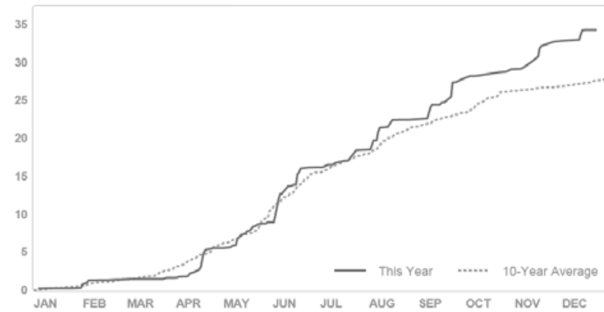
This study was sponsored in part by: AnnGro USA, LLC

AnnGro Additive with UAN through Pivot

Study ID: 195019201501
County: Buffalo
Soil Type: Hall silt loam; Wood River silt loam; Hord silt loam;
Planting Date: 4/15/15
Harvest Date: 10/5/15
Population: 35,000
Row Spacing (in.) 30
Hybrid: Channel 209-53 STX
Reps: 4
Previous Crop: Corn
Tillage: Strip-till
Herbicides: ***Pre:*** Lexar 1.5 qts/ac with crop oil ***Post:*** Roundup 33 oz/ac + AMS
Seed Treatment: Poncho 500
Foliar Insecticides: None

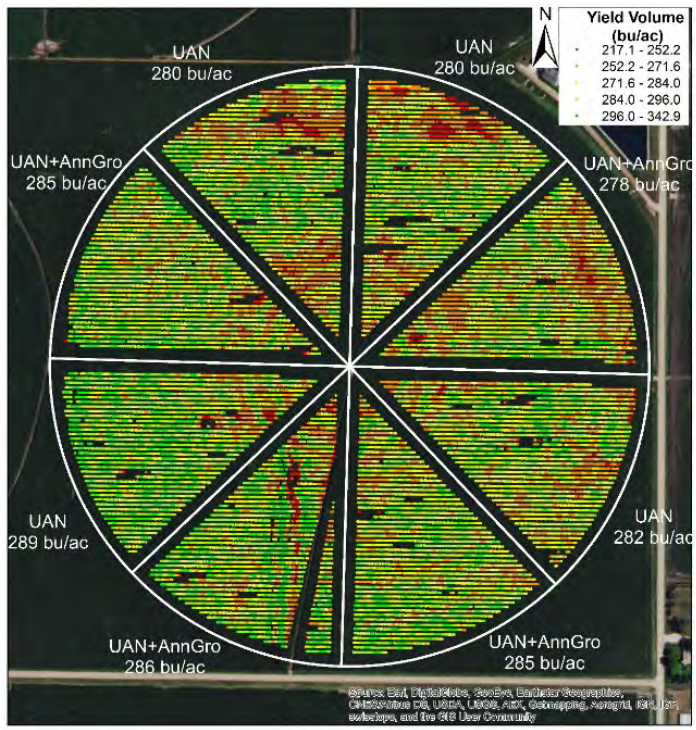
Foliar Fungicides: Headline AMP
Fertilizer: Spring - 20 gal/ac 32-0-0 and 5 gal/ac 10-34-0 on 3/20/15
15 gal/ac 32-0-0 on 4/15/15 at planting

Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: AnnGro® -EW Fertilizer Additive (ANNGRO USA) is a bio-based product which claims enhancement in uptake and transport of plant nutrients. The objective of this study is to evaluate the effects of AnnGro® -EW Fertilizer Additive applied with UAN fertilizer versus UAN fertilizer with no additives. The treatments are UAN and UAN with AnnGro® -EW. The treatments were applied through a center pivot. Both the UAN treatment and UAN with AnnGro® -EW were applied at a rate of 7.5 gpa at 3 times through the growing season between 6/20/15 and 7/5/15.

This product is not commercially available, therefore marginal net return is not included in the results.



Results:

	Yield (bu/ac)†	Moisture (%)	Harvest Stand Count
AnnGro in Solution with UAN 32%	284 A*	19.0 B	33,167 A
Check - UAN 32%	283 A	19.1 A	32,875 A
P-Value	0.6109	0.0647	0.6858

†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.

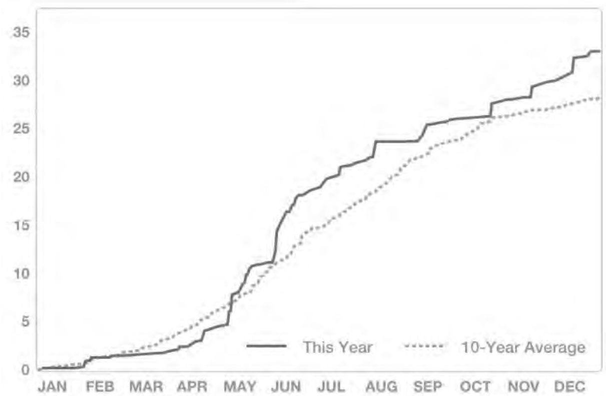
Summary: The addition of AnnGro® -EW did not have any impact on corn yields. Grain moisture at harvest was significantly drier for the AnnGro® -EW treatments. There was not difference in harvest stand counts between the AnnGro® -EW treatment and the check.

This study was sponsored in part by: AnnGro USA, LLC

Accomplish® LM on Soybeans

Study ID: 038035201501
County: Clay
Soil Type: Hastings silt loam;
Planting Date: 5/3/15
Harvest Date: 9/16/15
Population: 190,000
Row Spacing (in.) 15
Hybrid: Asgrow 24-31
Reps: 6
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** unknown ***Post:*** Sprayed 2 times with Roundup PowerMax
Seed Treatment: Standard
Foliar Fungicides: 3 lb/ac foliar sugar at R1
Fertilizer: 15 lb/ac P, 2 lb/ac Zn, and 15 lb/ac S (Fall applied)

Note: Soybeans were lightly shattering prior to harvest.
Irrigation: Pivot, Total: 4.10"
Rainfall (in.):



Introduction: In this study the grower looked at the effect of Accomplish® LM on soybean yield and economics compared to an untreated check. Product information is below. Accomplish® LM was applied at a rate of 2 qt/ac, in-furrow at planting. Soybeans were drilled in 15" rows.

NON PLANT FOOD INGREDIENTS:
Microorganisms .... <1%

Bacillus licheniformis .... $1x10^3$ cfu/ml*
Bacillus megaterium .... $1x10^3$ cfu/ml
Bacillus pumilus .... $1x10^3$ cfu/ml

**colony forming units/milliliter*

Inert Ingredients:
Water-based culture medium 99%

Product information from: *http://www.agrian.com/pdfs/Accomplish_LM_Label.pdf*

Results:

	Yield (bu/ac)†	Moisture (%)	Test Weight	Marginal Net Return ($/ac)‡
Check	76 A*	13.1 A	57 A	676.40
Accomplish® LM 2 qt/ac	76 A	13.2 A	57 A	660.40
P-Value	0.4844	0.7554	0.4126	N/A

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $16.00/acre Accomplish LM cost.

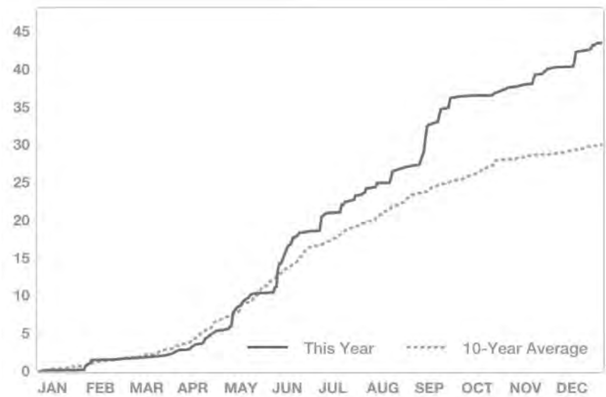
Summary: There was no statistical difference in soybean yield, moisture, stand counts, or test weight for the Accomplish® LM compared to the untreated check.

Manganese on Soybean

Study ID: 026185201502
County: York
Soil Type: Hastings silt loam;
Planting Date: 5/12/15
Harvest Date: 10/3/15
Population: 140,000
Row Spacing (in.) 30
Hybrid: Pioneer 93Y15
Reps: 6
Previous Crop: Corn
Tillage: Ridge-Till
Herbicides: ***Pre:*** 24 oz/ac Roundup PowerMax and 5 oz/ac Authority First on 5/12/15 ***Post:*** 32 oz/ac Roundup PowerMax on 6/9/15, 40 oz/ac Roundup PowerMax, and 6 oz/ac Targa on 6/30/15
Seed Treatment: Unknown
Foliar Insecticides: Unknown

Foliar Fungicides: Unknown
Fertilizer: None other than product being tested

Irrigation: Pivot, Total: 4"
Rainfall (in.):



Soil Tests:

					Phosphorus (P)		Ammonium Acetate (ppm)						% Base Saturation				
ID	Soil pH 1:1	OM LOI-%	0-10" Nitrate (ppm)	11-24" Nitrate (ppm)	Weak Bray 1:7 (ppm)	Strong Bray 1:7 (ppm)	K	Ca	Mg	Ca-P Sulfate (ppm S)	Zn (ppm)	Sum of Cations (me/100g)	H	K	Ca	Mg	Na
1	6.8	2.9	5	4	17	33	467	2416	358	19	3.4	16.3	0.0	7.3	74.4	18.3	-
2	7.0	2.8	7	3	28	61	441	2066	299	15	4.3	14.0	0.0	8.1	74.1	17.8	-
3	7.1	2.2	4	-	26	128	414	4003	757	13	2.4	27.4	0.0	3.9	73.1	23.0	-

Introduction: Conklin® Feast® Micro Master (6.0% chelated manganese) was applied at 1 pt/ac on 6/30/15 with herbicide application (40 oz/ac Roundup, 6 oz/ac Targa, 1 lb/ac sugar). Soil sample test results for the study area are reported above. The application was 24 rows wide; the grower harvested the center 20 rows of each strip to eliminate spray drift contamination. The purpose of this study was to determine if the application of the manganese product increased soybean yields and profit.

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Check (Roundup + Targa + Sugar)	79 A*	11.7 A	703.10
Check (Roundup + Targa + Sugar) + Manganese	80 A	11.7 A	707.50
P-Value	0.4083	<0.0001	N/A

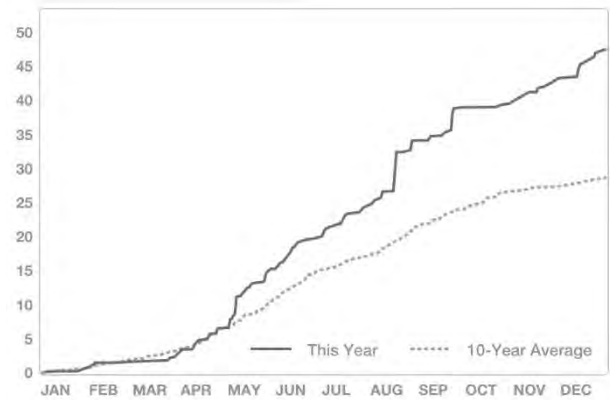
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $4.50/acre Manganese product cost.

Summary: The application of manganese did not increase soybean yields or result in grain moisture differences.

Strip-till Fertilizer Placement in Soybeans

Study ID: 024155201502
County: Saunders
Soil Type: Tomek silty clay loam;
Planting Date: 5/19/2015
Harvest Date: 9/30/15
Population: 140,000
Row Spacing (in.) 30
Hybrid: Fontanelle 64R20
Reps: 7
Previous Crop: Corn
Tillage: Strip-till
Herbicides: ***Pre:*** Burndown 1pt 2,4-D (4lb/gal), 2 oz/ac Authority XL, and 18 oz/ac Authority Elite on 4/24/2015 ***Post:*** 32 oz/ac PowerMax, 1qt/ac Class Act, 6.5 oz/ac Revlolution, and 4 oz/ac Avatar on 6/26/2015
Seed Treatment: Acceleron - Fungicide
Unknown - Insecticide

Foliar Insecticides: Leverage 4 oz/ac on 7/30/15
Foliar Fungicides: Priaxor 8 oz/ac on 7/30/15
Irrigation: Pivot, Total: 1"
Rainfall (in.):



Introduction: Strip tillage is an agronomic practice that prepares the seedbed and offers the opportunity for nutrient placement. This grower typically supplies fertilizer at strip-till in the fall prior to corn production. The purpose of this study was to evaluate placement of nutrients with strip-till prior to soybeans. This study compared an application of 100 lbs/acre MESZ to an application of 100 lbs/acre MESZ plus 50 lbs/acre 0-0-60. MESZ (Micro Essentials SZ) is a 12-40-0-10S-1Zn product. Strip-till and fertilizer application was completed on April 23, 2015. Soil test results are not available for the field.

Results:

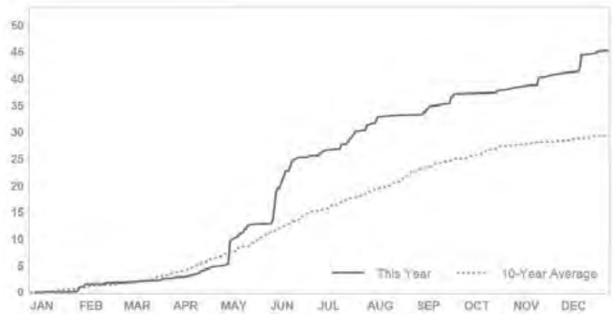
	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
MESZ (100 lbs)	83 A*	12.2 A	708.95
MESZ (100 lbs) + 0-0-60 (50 lbs)	84 A	12.2 A	706.98
P-Value	0.3039	0.8182	N/A

†Yield data from weigh wagon. Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans, $10.87/acre 0-0-60, and $29.75/acre Mesz.

Summary: The addition of 50/acre of 0-0-60 to the 100 lbs/acre MESZ applied with strip-till did not result in increased yield or net return. There was no difference in grain harvest moisture between the two treatments. Because there was no completely untreated check, it is unknown if the addition of 100 lbs/acre MESZ was of benefit to crop yield and net return.

Fulvic Acid In-Furrow on Soybeans

Study ID: 032035201501
County: Clay
Soil Type: Hastings silt loam; Hastings silty clay loam; Crete silt loam;
Planting Date: 5/1/15
Harvest Date: 10/1/15
Population: 155,000
Row Spacing (in.) 30
Hybrid: Asgrow 2431
Reps: 6
Previous Crop: Corn
Tillage: Conventional Till
Herbicides: ***Pre:*** 6.4 oz/ac Optil Pro ***Post:*** 36 oz/ac Roundup
Seed Treatment: Acceleron + X-ite Bio Innoculant
Insecticides: 5 oz/ac Hero (foliar application with Priaxor)
Foliar Fungicides: 4 oz/ac Priaxor
Fertilizer: 11-52-0 zone applied, 1/22/15.
Note: Hail, Sept. 8, 15% damage
Irrigation: Pivot, Total: 6"
Rainfall (in.):



Introduction: Fulvic Acid was applied in furrow. This product is sold by Aurora Coop; active ingredients are not available. The Fulvic Acid treatment was compared to an untreated check.

Results:

	Yield (bu/ac)†	Moisture (%)	Marginal Net Return ($/ac)‡
Check	91 A*	10.9 A	809.90
Fulvic Acid	91 A	10.6 B	805.90
P-Value	0.6941	0.0907	N/A

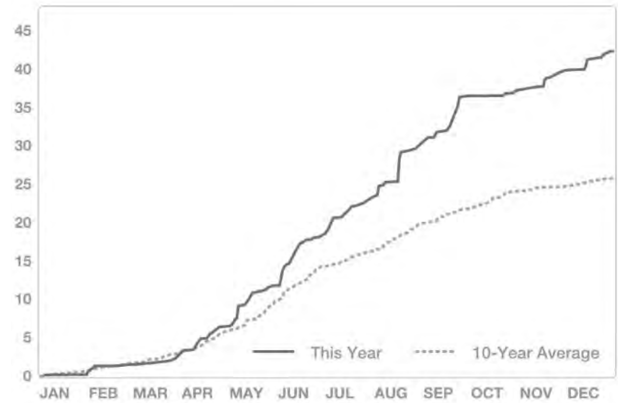
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $4.00/ac Fulvic Acid treatment.

Summary: Fulvic Acid did not result in an increase in yield. The check treatment had significantly higher grain moisture when compared to the Fulvic Acid treatment.

Metalosate Big 5 on Soybeans

Study ID: 069023201503
County: Butler
Soil Type: Hastings silt loam;
Planting Date: 6/1/15
Harvest Date: 10/9/15
Population:
Row Spacing (in.) 30
Hybrid: NK S27-J7
Reps: 4
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** unknown ***Post:*** 40 oz/ac RoundUp PowerMax, 17 lbs/100 gall AMS, and 4 oz/ac Cadet on 7/9/15

Irrigation: Pivot, Total: unknown
Rainfall (in.):



Introduction: This study was looking at Metalosate Big 5 applied with herbicide. The herbicide only (check) consisted of 40 oz/ac RoundUp PowerMax, 17 lb/100 gal AMS, and 4 oz/ac Cadet. Additionally, 2 rates of Metalosate Big 5 were tested - 16 oz/ac and 32 oz/ac. Products were applied at 10 gpa on 7/9/15 using air induction nozzles, which resulted in spotting of application rather than uniform seen with a flat fan nozzle. Foliar tissue samples were taken 7 days after application. Detailed product information is not available as this is an experimental product.

Results:

	N	P	K	Mg	Ca	S	Na	Fe	Na	B	Cu	Zn
	-----------------------------%---------------------------------							------------------ppm------------------				
Herbicide Only (Check)	6.02A*	0.47A	3.08A	0.44A	1.16A	0.35A	0.00020A	153A	102A	49B	12.50A	45B
Herbicide + 16 oz/ac Metalosate Big 5	5.72A	0.47A	3.13A	0.41A	1.11A	0.35A	0.00020A	176A	89A	49B	12.25A	52AB
Herbicide + 32 oz/ac Metalosate Big 5	5.86A	0.47A	3.15A	0.42A	1.10A	0.36A	0.00020A	202A	101A	52A	12.25A	60A
P-Value	*0.19*	*0.71*	*0.71*	*0.13*	*0.11*	*0.48*	*0.42*	*0.28*	*0.87*	*0.04*	*0.77*	*0.01*

	Height (in.)		**Pods/plant**		**Chlorophyll Meter**		**Trifoliate Nodes**	
	Aug. 4	**Aug. 11**	**Aug. 4**	**Aug. 11**	**Aug. 4**	**Aug. 11**	**Aug. 4**	**Aug. 11**
Herbicide Only (Check)	23.6 A	31.0 A	31 A	39 A	39.4 A	40.4 A	11 B	14 A
Herbicide + 16 oz/ac Metalosate Big 5	24.4 A	31.7 A	36 A	35 A	39.5 A	39.9 A	12 A	14 A
Herbicide + 32 oz/ac Metalosate Big 5	23.7 A	29.5 A	35 A	36 A	40.4 A	40.3 A	12 A	14 A
P-Value	*0.5711*	*0.1849*	*0.2352*	*0.1454*	*0.2875*	*0.8123*	*0.0524*	*0.8614*

	Yield (bu/ac)†	**Protein (%)**	**Oil (%)**	**Weight (g/100 seeds)**
Herbicide Only (Check)	69 A	39.7 A	19.1 A	18 A
Herbicide + 16 oz/ac Metalosate Big 5	67 A	40.0 A	19.0 A	17 A
Herbicide + 32 oz/ac Metalosate Big 5	69 A	39.7 A	19.7 A	18 A
P-Value	*0.1819*	*0.5919*	*0.18*	*0.88*

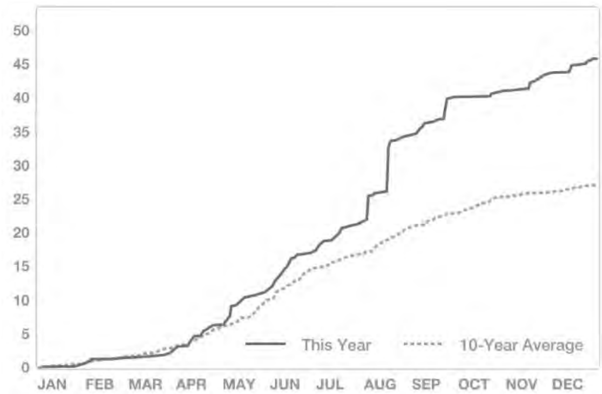
†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.

Summary: Boron tissue samples were higher for the 32 oz/ac rate of Metalosate when compared to the 16 oz/ac rate and the check. Zinc tissue samples for the 32 oz/ac rate of Metalosate were higher than the check. Both rates of Metalosate had an increase in number of trifoliate nodes on Aug. 4 when compared to the check. No differences were seen in height, pods/plant, chlorophyll readings, yield, % protein, % oil, or seed weight. No cost information is available for Metalosate Big 5 as it is an experimental product.

Commence® Seed Treatment on Soybeans

Study ID: 114023201501
County: Butler
Soil Type: Hastings silt loam; Butler silt loam; Hastings silty clay loam; Hobbs silt loam;
Planting Date: 6/2/15
Harvest Date: 10/24/15
Tillage: No-Till
Row Spacing (in.) 36
Hybrid: Mycogen 5N284R2
Reps: 8

Irrigation: yes, Total: unknown, rainy year, only some irrigation applied
Rainfall (in.):



Introduction: This study was looking at Commence® seed treatment applied to soybeans. The product was applied at 2 oz/50 lbs of seed. Product cost was $6/ac and application of the product was $2/ac. This product was a stand-alone application on soybeans. Product information is at right.

GUARANTEED ANALYSIS	
Cobalt (Co)	1.90%
Copper (Cu)	0.45%
Iron (Fe)	0.94%
Manganese (Mn)	0.61%
Zinc (Zn)	0.38%

PLANT NUTRIENT DERIVED FROM: Cobalt Carbonate, Cobalt Sulfate, Copper (II) Carbonate, Iron (III) Oxide, Manganese (II) Oxide, Manganese (II) Sulfate, Zinc Carbonate, Zinc Sulfate

Product information from:
http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CCommence_for_Soybeans_9_1_2015_10_52_24_AM.pdf

Results: Note: Plots were not randomized therefore conclusions should not be extrapolated beyond this field.

	Stand Count	Height (in.)					
	June 25	June 25	July 7	July 13	July 21	July 31	Aug 12
Check	147,696 A	3.6 A	6.4 A	8.9 A	14.9 A	21.1 A	32.7 A
Commence 8 oz/ac	148,807 A	3.5 A	6.4 A	9.2 A	15.3 A	21.4 A	33.6 A
P-Value	0.7408	0.8317	0.6504	0.1681	0.2713	0.4578	0.1463

	Trifoliate Nodes					
	June 25	July 7	July 13	July 21	July 31	Aug 12
Check	2 A	5 A	6 A	8 A	10 A	13 A
Commence 8 oz/ac	2 A*	4 A	6 A	8 A	10 A	13 A
P-Value	0.4424	0.8682	0.1094	0.6586	0.2086	0.6291

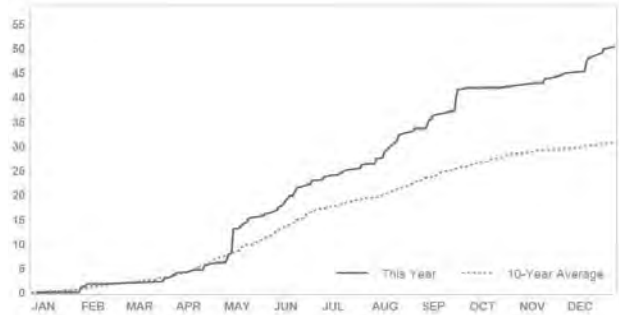
	Pods/plant Aug 12	Chlorophyll Meter Aug 12	Yield (bu/ac)†	Protein (%)	Oil (%)	Weight (g/100 seeds)	Marginal Net Return ($/ac)‡
Check	31 A	39.1 A	60 A	43.2 A	18.7 A	16 A	534.00
Commence 8 oz/ac	32 A	39.0 A	60 A	43.1 A	18.5 A	16 A	526.00
P-Value	0.5033	0.7999	0.2634	0.3807	0.6058	0.1702	N/A

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $8/acre Commence seed treatment and application cost.

Summary: There was no height, trifoliate node, stand count, pods per plant, chlorophyll reading, yield, % protein, % oil, or seed weight differences between the two treatments.

Commence® Seed Treatment on Soybeans

Study ID: 221109201501
County: Lancaster
Soil Type: Crete silty clay loam; Kennebec silt loam; Colo silty clay loam;
Planting Date: 6/9/15
Harvest Date: 10/15/15
Row Spacing (in.) 30
Hybrid: Pioneer 31T11R
Reps: 7 (Yield was only measured for 4 reps)
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** unknown ***Post:*** 12.8 oz/ac FlexStar 12.8, 36 oz/ac RoundUp PowerMax, 1 qt/ac TailWind, 2 qt/100 gal FinishLine, and Navigator 3% on 6/30/15 at 15 gpa shortly after the 1st trifoliate stage.
Note: part of field had areas that were underwater due to storms.
Irrigation: None
Rainfall (in.):



Soil Sample:

								Ammonium Acetate ppm					DTPA ppm						% Base Saturation				
Soil pH 1:1	Modified WDRF BpH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	OM LOI-%	FIA Nitrate ppm N	0-8" Nitrate Lbs N/A	M-P3 ppm P	K	Ca	Mg	Na	Ca-P Sulfate ppm S	Zn	Fe	Mn	Cu	Hot Water Boron ppm B	Sum of Cations me/100g	H	K	Ca	Mg	Na
5.5	6.4	0.41	NONE	4.2	30.5	73	47	364	2763	654	70	13	1.63	138.7	20.3	1.53	1.05	26.1	21	4	53	21	1

Introduction: This study was looking at Commence® seed treatment applied to soybeans. The product was applied at 2 oz/50 lbs of seed. Product cost was $6/ac and application of the product was $2/ac. This product was a stand-alone application on soybeans. Product information is at right.

GUARANTEED ANALYSIS
Cobalt (Co)..................... 1.90%
Copper (Cu) 0.45%
Iron (Fe)......................... 0.94%
Manganese (Mn)............ 0.61%
Zinc (Zn) 0.38%

PLANT NUTRIENT DERIVED FROM: Cobalt Carbonate, Cobalt Sulfate, Copper (II) Carbonate, Iron (III) Oxide, Manganese (II) Oxide, Manganese (II) Sulfate, Zinc Carbonate, Zinc Sulfate

Product information from:
http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CCommence_for_Soybeans_9_1_2015_10_52_24_AM.pdf

Results: Plots were not randomized therefore conclusions should not be extrapolated beyond this field.

	Early Season Stand Counts		Height (in.)				
	June 22	**July 1**	**July 1**	**July 13**	**July 23**	**July 30**	**Aug 13**
Check	132,049 A*	137,401 A	3.2 A	7.1 A	14.1 A	20.0 A	28.3 A
Commence 8 oz/ac	133,729 A	135,596 A	3.3 A	7.2 A	14.4 A	20.0 A	29.2 A
P-Value	*0.6891*	*0.4918*	*0.536*	*0.6572*	*0.3463*	*0.9956*	*0.4913*

	Trifoliate Nodes				
	July 1	**July 13**	**July 23**	**July 30**	**Aug 13**
Check	2 A	5 A	7 A	9 B	13 A
Commence 8 oz/ac	2 A	5 A	8 A	10 A	14 A
P-Value	*0.9288*	*0.7046*	*0.831*	*0.0998*	*0.2819*

	Pods/plant July 13	Chlorophyll Meter Aug 13	Yield (bu/ac)†	Oil (%)	Protein (%)	Marginal Net Return ($/ac)‡
Check	39 A	38.6 A	80 A	20.1 A	39.7 A	712.00
Commence 8 oz/ac	39 A	38.4 A	82 A	20.0 A	40.0 A	721.80
P-Value	*0.9938*	*0.5298*	*0.3534*	*0.4586*	*0.4723*	*N/A*

†Bushels per acre corrected to 13% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $8.90/bu soybeans and $8.00/ac Commence treatment.

Summary: Untreated seed had fewer trifoliate nodes on June 30. There were no height, stand counts, pots/plant, chlorophyll, % oil, % protein, or yield differences between the Commence® seed treatment and the untreated check.

Combined Analysis Commence® Seed Treatment on Soybeans

Introduction: This analysis looks at two studies evaluating Commence® seed treatment applied to soybeans. The product was applied at 2 oz/50 lbs of seed at both locations. Product cost was $6/ac and application of the product was $2/ac. This product was a stand-alone application on soybeans. Product information is below. Both studies were small plot studies conducted on-farm in Butler and Lancaster Counties. There were a total of 15 replications (12 replications of yield, protein, and oil).

GUARANTEED ANALYSIS		**PLANT NUTRIENT DERIVED FROM:** Cobalt Carbonate, Cobalt Sulfate, Copper (II) Carbonate, Iron (III) Oxide, Manganese (II) Oxide, Manganese (II) Sulfate, Zinc Carbonate, Zinc Sulfate
Cobalt (Co)	1.90%	
Copper (Cu)	0.45%	
Iron (Fe)	0.94%	
Manganese (Mn)	0.61%	
Zinc (Zn)	0.38%	

Product information from:
http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CCommence_for_Soybeans_9_1_2015_10_52_24_AM.pdf

The objective was to determine the effect of Commence® Seed Treatment on yield, stand, chlorophyll, pods/plant, and seed protein and oil content. Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was done with Fisher's LSD.

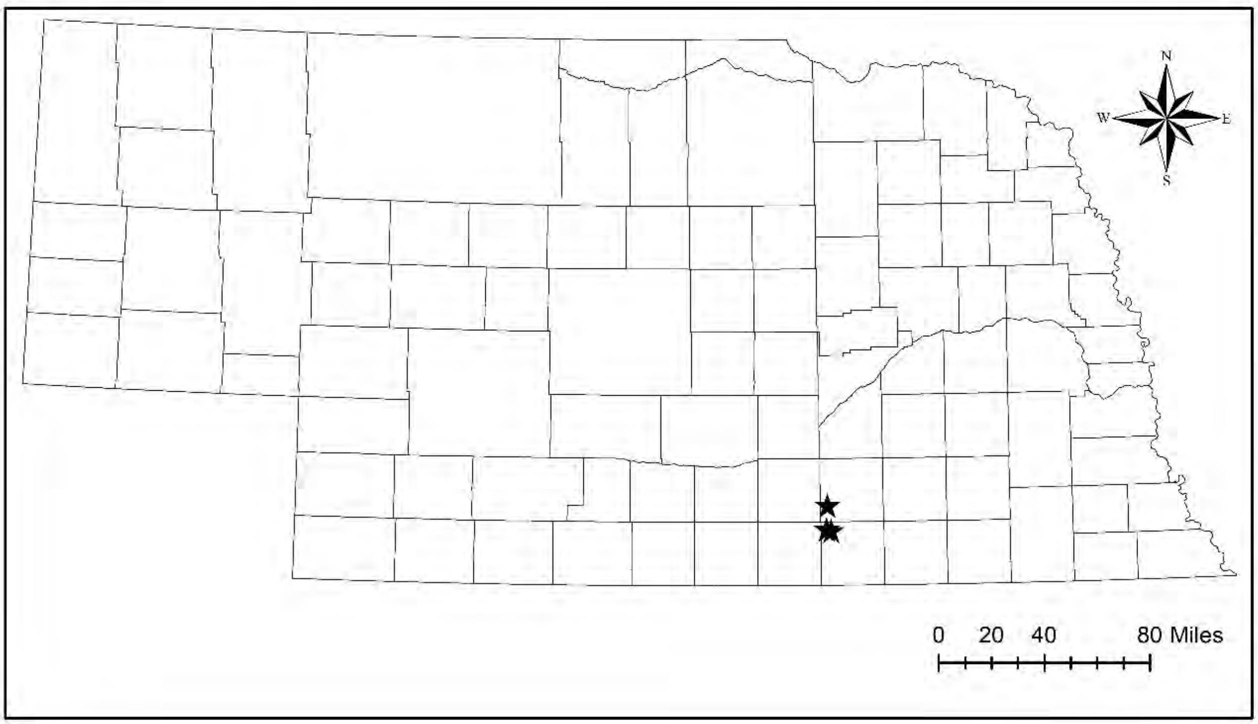
	Yield Bu/ac	**Stand Count** Plants/acre	**Chlorophyll**	**Pods/plant**	**Protein (%)**	**Oil (%)**
Treatment mean (treated-check)†	0.8_{ns}	-566_{ns}	-0.195_{NS}	0.33_{NS}	0.059_{NS}	-0.10_{NS}
Site (P>F)	<.0001	<.0001	0.0956	0.0007	<.0001	0.0001
Treatment (P>F)	0.2033	0.7674	0.4296	0.8335	0.6305	0.5586
Site*Treatment (P>F)	0.4712	0.4382	0.7182	0.9475	0.1956	0.9392

†Mean difference between control and treatment. Negative values indicate the control value is greater than the treated value.
Ns, indicates mean difference is not significant at alpha = 0.10

Summary: Looking across both sites there were no significant yield, stand count, chlorophyll meter, pods per plant, protein, or oil differences between the Commence® treated seed and the untreated seed.

SUGAR STUDIES

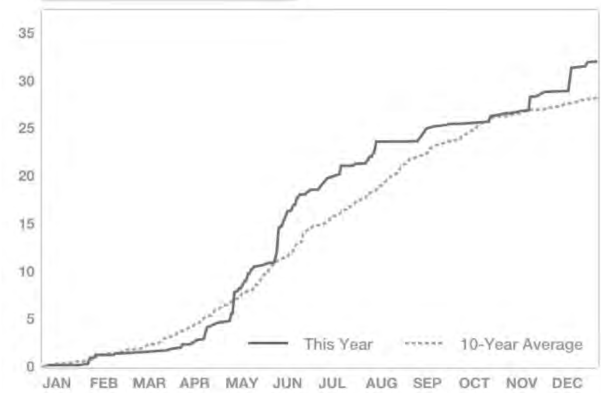
- Cane Molasses on Corn
- Sugar on Sorghum
- Sugar on Sorghum
- Combined Sugar on Sorghum Analysis (2014-2015)



Cane Molasses on Corn

Study ID: 038035201503
County: Clay
Soil Type: Crete silt loam;
Planting Date: 4/23/15
Harvest Date: 10/20/15
Population: 34,000
Row Spacing (in.) 30
Hybrid: Dekalb 62-68
Reps: 5
Previous Crop: Corn
Tillage: Ridge-Till
Herbicides: ***Pre:*** Sprayed once with Roundup PowerMax ***Post:*** unknown
Seed Treatment: Acceleron 250
Foliar Insecticides: none
Foliar Fungicides: none

Fertilizer: 100 lb/ac 11-52-0; 205 lb/ac N, 2 lb/ac Zn, 15 lb/ac S; 6 gal/ac 10-34-0
Irrigation: Gravity, Total: 5.0"
Rainfall (in.):



Introduction: This is the fifth year these producers have applied sugar to their corn fields. The objective was to determine the impact of sugar application on corn yield, economics, and standability. Products tested and yield and stalk rot results from 2010-2014 are shown at right. While yield was not statistically increased in these studies, there was a reduction in stalk rot for using the sugar products. This year 1 qt/ac molasses were applied at V8. There was a hard, fast rain immediately after the application, so the molasses were re-applied right after the rain event.

Field note: this field had severe grey leaf spot and no fungicide was used.

2010-2011, 2013-2014 Sugar Applied to Corn Trials-Clay Co. Producer

Producer	Avg Yield Check	Avg Yield Sugar
2010 Clay Co. (6 reps) 3 lb gran. Sugar/ac	208.9 (22% stalk rot)	210.6 ns (3% stalk rot)
2011 Clay Co. (6 reps) 3 lb gran. Sugar/ac	209.6 (19% stalk rot)	213.2 ns (12% stalk rot)
2013 Clay Co. (6 reps) 3 qts Plen-T-Sweet**/ac	222.6 (19% stalk rot)	214.2* (16% stalk rot)
2014 Clay Co. (6 reps) 13 oz liquid brown sugar/ac	226.2 (24% stalk rot)	228.6 ns (16% stalk rot) ns

*Indicates statistically significant at 95% confidence level. (2014 stats at 90% level).
**Recommended rate is 1 qt of Plen-T-Sweet so the high rate coupled with irrigation problems may have affected study in 2013.
3 lbs sugar (2010-2011), 3 qts Plen-T-Sweet (2013), 13 oz liquid brown sugar (2014) added to 10 gallons of water applied at V7-V8 leaf stage. Stalk rot ratings taken 2 weeks prior to harvest using the pinch test. Cost of sugar was $1.25/acre in 2010-2011, $6/ac in 2013 (should be $2 with correct rate), and $3.04/ac in 2014.

Results:

	Yield (bu/ac)†	Moisture (%)	Test Weight	Harvest Stand Count	Stalk Rot (%)	Marginal Net Return ($/ac)‡
Check	194 A*	12.1 A	63 A	30,800 A	61 A	708.10
Molasses	194 A	12.0 A	63 A	32,000 A	62 A	707.30
P-Value	0.9793	0.6135	0.5589	0.3239	0.941	N/A

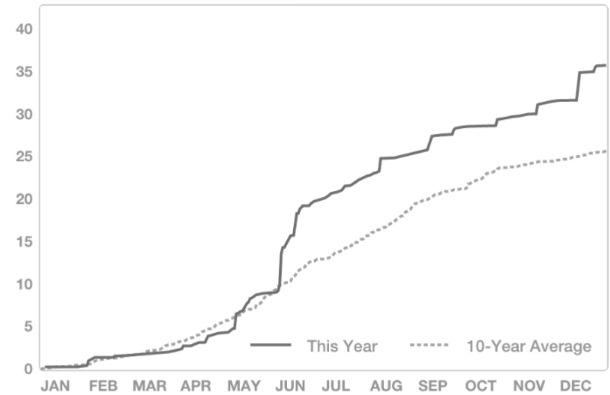
†Bushels per acre corrected to 15.5% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.65 corn and $0.80/qt molasses treatment cost.

Summary: In 2015, there was no yield, stalk rot, stand count, test weight, or moisture difference between the check and the molasses treatment.

Sugar on Sorghum

Study ID: 009129201501
County: Nuckolls
Soil Type: Hall silt loam;
Planting Date: 5/18/15
Harvest Date: 10/6/15
Population: 65,000
Row Spacing (in.) 30
Hybrid: Pioneer 85P05
Reps: 8
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** 2 qt/ac Lumax and 32 oz/ac Touchdown on 4/28/15;
0.7 qt/ac Lumax, 32 oz/ac Touchdown, and 0.5 lb/ac aatrex on 5/21/15 ***Post:*** 13 oz/ac Huskie and 1lb/ac aatrex on 6/18/15
Seed Treatment: Cruiser Max
Fertilizer: Injected 120 lb N/ac as liquid 32% on 4/14/15; Broadcast 34 lb P/ac and 1 lb Zn/ac on 4/18/15

Note: Aug. hail storm caused wind/hail damage more to west end of field. Hard and heavy rains at time of emergence thinned stand.
Irrigation: None
Rainfall (in.):



Introduction: This was the second year this producer has tried applying sugar to sorghum. The objective was to determine the effect of sugar applicaion on yield, economics, and lodging of sorghum. Rescue herbicide treatments in sorghum often lead to lodging, making harvest more difficult. After seeing the corn stalk strength results, the producer wondered if adding sugar to sorghum would help with lodging after adding a post rescue treatment of Huskie and Atrazine to his field. Three lb per acre of granulated sugar was applied in 10 gallons of water and sprayed in a paired comparison design to sorghum at V7. The sprayer was then filled with Huskie and Atrazine and applied to the entire field which included the plot area.

Results:

	Yield (bu/ac)†	Moisture (%)	Test Weight	Stand Count (Sept. 21)	Lodging (%) (Sept. 21)	Marginal Net Return ($/ac)‡
Check	139 A*	18.1 A	61 A	52,333 A	12 A	500.40
Foliar Sugar	139 A	18.6 A	60 A	55,167 A	3 B	499.08
P-Value	*0.9075*	*0.4291*	*0.2038*	*0.5883*	*0.0478*	*N/A*

†Bushels per acre corrected to 14% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.60 sorghum and $1.32/ac. treatment cost. No additional application cost is added as it is expected that this product would be applied with a post herbicide.

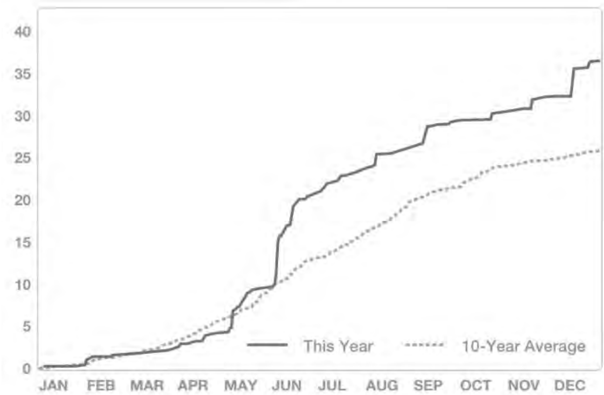
Summary: Consistent with research in 2014, there was no statistical yield, moisture, or stand count difference between the sugar and check treatments. This site did see a significant reduction in lodging for the sugar treatment.

Figure 1: Harvest of research plot testing sugar application to sorghum.

Sugar on Sorghum

Study ID: 009129201502
County: Nuckolls
Soil Type: Hastings silt loam;
Planting Date: 5/30/15
Harvest Date: 10/15/15
Population: 65,000
Row Spacing (in.) 30
Hybrid: Dekalb 37-07
Reps: 10
Previous Crop: Wheat
Tillage: No-Till
Herbicides: ***Pre:*** 2 qt/ac Lumax and 32 oz/ac Touchdown on 4/28/15; 0.7 qt/ac Lumax, 32 oz/ac Touchdown and 0.5 lb/ac atrazine on 6/2/15
Post: 13 oz/ac Huskie and 1 lb/ac atrazine on 6/27/15
Seed Treatment: Poncho
Foliar Insecticides: unknown
Foliar Fungicides: unknown

Fertilizer: Injected 120 lb N/ac as liquid 32% on 4/14/15;
Broadcast 34 lb P/ac and 1 lb Zn/ac on 4/18/15
Note: Heavy rains at time of emergence thinned stands.
Irrigation: None
Rainfall (in.):



Introduction: This was the second year this producer has tried applying sugar to sorghum. The objective was to determine the effect of sugar applicaion on yield, economics, and lodging of sorghum. Rescue herbicide treatments in sorghum often lead to lodging, making harvest more difficult. After seeing the corn stalk strength results, the producer wondered if adding sugar to sorghum would help with lodging after adding a post rescue treatment of Huskie and Atrazine to his field. Three lb per acre of granulated sugar was applied in 10 gallons of water and sprayed in a paired comparison design to sorghum at V7. The sprayer was then filled with Huskie and Atrazine and applied to the entire field which included the plot area.

Results:

	Yield (bu/ac)†	Moisture (%)	Test Weight	Stand Count (Sept. 21)	Lodging (%) (Sept. 21)	‡Marginal Net Return ($/ac)
Check	130 A	14.3 A	61 A	56,700 A	1 A	468.00
Foliar Sugar	133 A*	14.6 A	60 A	57,000 A	1 A	477.48
P-Value	*0.1807*	*0.5633*	*0.4187*	*0.8756*	*0.6783*	*N/A*

†Bushels per acre corrected to 14% moisture.
*Values with the same letter are not significantly different at a 90% confidence level.
‡Net Return based on $3.60/bu sorghum, $1.32/ac treatment cost. No additional application cost is added as it is expected that this product would be applied with a post herbicide.

Summary: There was no statistical yield difference between the sugar and check treatments for yield, lodging, stand count or moisture. This is consistent with results from 2014.

Combined Analysis of Sugar on Sorghum (2014-2015)

Introduction: There were three studies in Nuckolls County in 2014 and 2015 that looked at sugar application on sorghum. All sites were no-till, rainfed sites. Rescue herbicide treatments in sorghum often lead to lodging, making harvest more difficult. It was speculated that adding sugar to sorghum may help with lodging after adding a post rescue herbicide. For each site, 3 lb/acre of granulated sugar was applied in 10 gallons of water and sprayed in a paired comparison design to sorghum at V7. **The objective was to determine the effect of sugar applicaion on yield, economics, and lodging of sorghum.** Data analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was done with Fisher's LSD.

	Yield	Moisture	Stand Count	Lodging
	Bu/ac	%	Plants/acre	%
Treatment mean (treated-check)†	1.6 ns	0.33 ns	1711 ns	-3.7
Site (P>F)	0.0005	<.0001	0.0357	0.0005
Treatment (P>F)	0.3346	0.3009	0.344	0.0050
Site*Treatment (P>F)	0.7872	0.9161	0.8054	0.0107

†Mean difference between control and treatment. Negative values indicate the control value is greater than the treated value.
Ns, indicates mean difference is not significant at alpha = 0.10

Summary: Looking across all 3 sites, there was no significant yield, moisture, or stand count differences between the check and the sugar application. However, there was a significant reduction in lodging for the sugar treatment (3.7%) when compared to the check. Additional sites and years of research will be helpful in understanding this trend.

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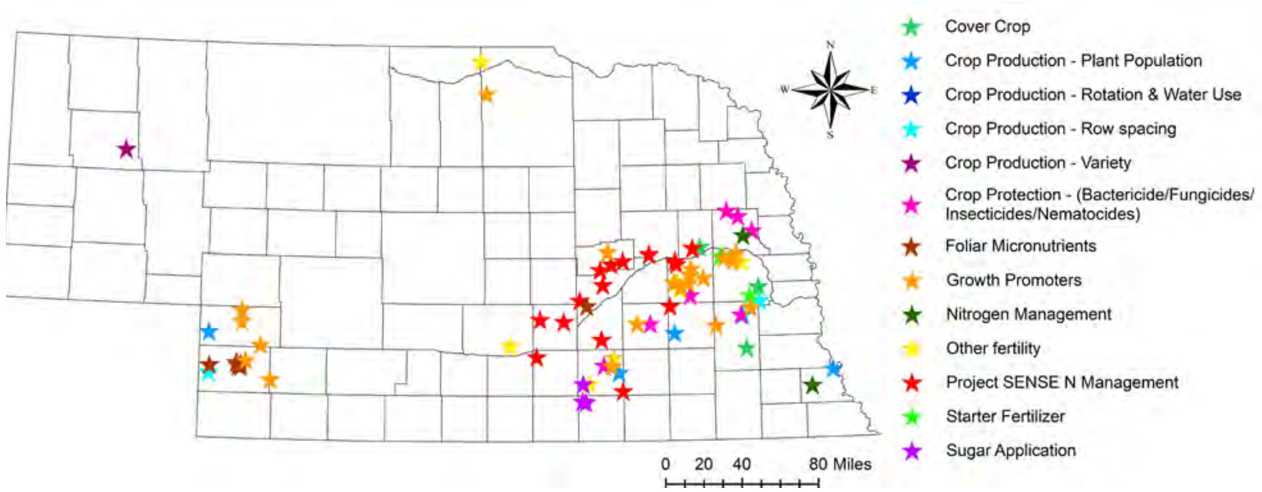
2015 Study Locations



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