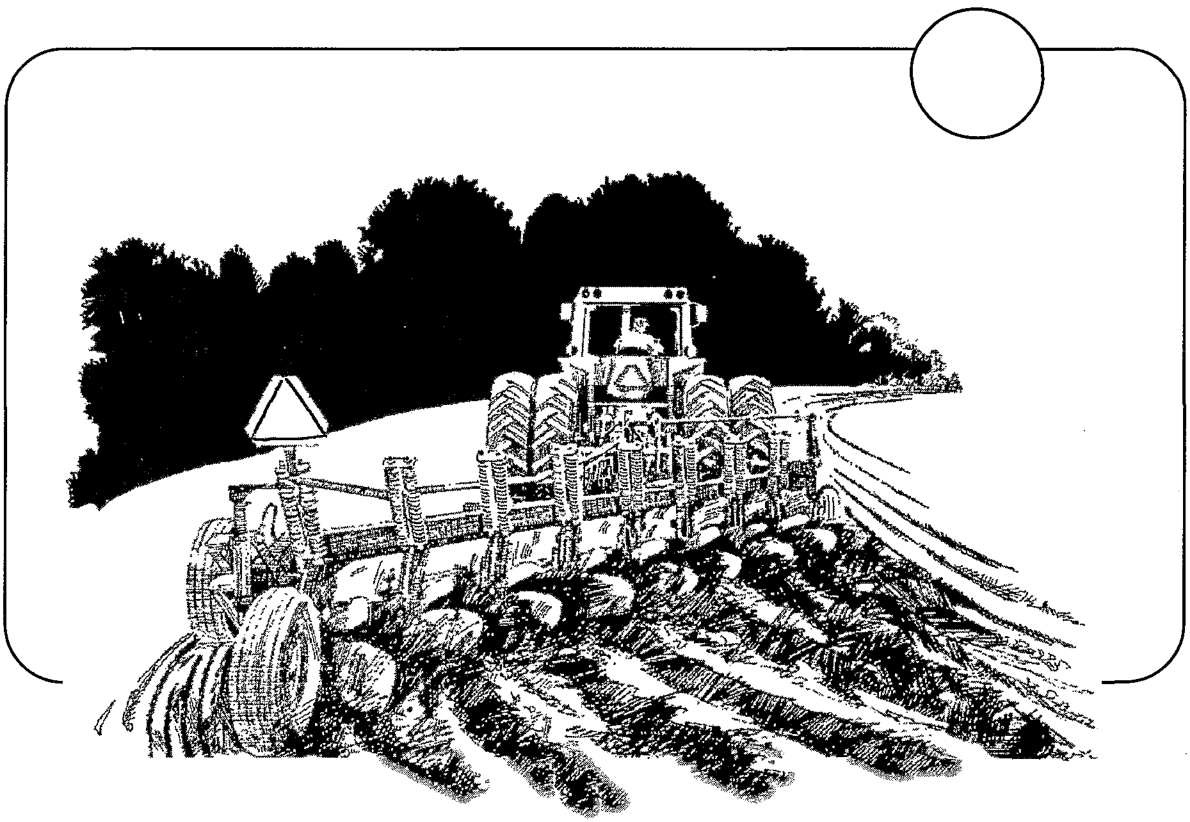
Agronomic Crops Team On-Farm Research Reports 2000



March 2001
Special Circular 179
Ohio Agricultural Research and Development Center
In Partnership With Ohio State University Extension, the Agricultural Industry, and Farmers

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Agronomic Crops Team On-Farm Research Projects 2000

Edited By

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Ohio Agricultural Research and Development Center
Ohio State University Extension

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Contents

Introduction

This booklet contains the on-farm research results of Extension agents affiliated with the Ohio State University Extension Agronomic Crops Team. Results are primarily from experiments conducted during 2000.

All research trials in the report used at least three replications of the treatments compared. Many of the results reported are based on a single year of data. For the producers who collaborated in these trials and those who read these results, major production changes should not be based on one year of information. This information is published to stimulate discussion and to encourage further testing on individual farms.

We hope that the publishing of these applied research reports will enhance the Agronomic Crops Team's efforts in meeting the needs of Ohio farmers and the state's agricultural industry. We would also like to express our appreciation to all the Ohio producers who participated in these trials.

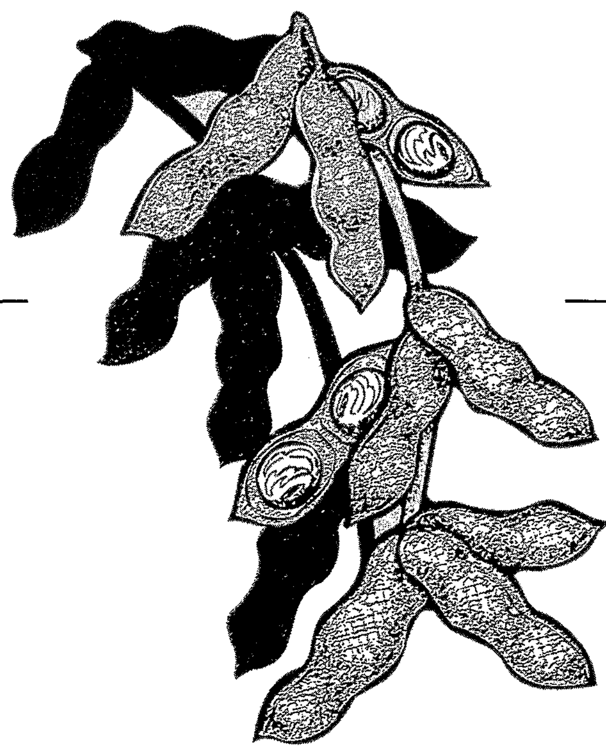
Editor

Phil E. Rzewnicki, On-Farm Research Coordinator

Review Committee

Dennis Baker, Extension Agriculture/Natural Resources Agent
Ed Lentz, Northwest District Agronomy Specialist
Jeff Stachler, Extension Associate, Weed Science

Soybeans



Apron Seed Treatment on Soybeans

Dennis Baker, Extension Agriculture and Natural Resources Agent

Objective

The objective of this research is to compare soybean yields using two rates of Apron fungicide seed treatment and a no-treatment control.

Background

Test Site:	Darke County Farm	Row Width:	30 inch
County:	Darke	Soil Test:	pH 7.0, P 16 ppm, K 170 ppm
Nearest Town:	Greenville	Fertilizer:	0-46-0 100 lb./A
Soil Types:	Patton silty clay loam		0-0-60 125 lb./A
	Brookston silty clay loam	Herbicides:	PRE – Roundup (1 qt./A)
	Crosby silt loam		POST – Roundup (1.5 pt./A)
	Miami silt loam	Variety:	Northrup King S34-B2
Drainage:	Subsurface	Seeding Rate:	195,000 seeds/A
Tillage:	No-till	Planting Date:	May 16, 2000
Previous Crop:	Corn	Harvest Date:	October 11, 2000

Methods

One of the most yield-robbing diseases of soybeans is Phytophthora Root Rot. In soils where this is likely to be a problem (heavy, poorly drained soils), it is recommended that a resistant variety be used in combination with a seed treatment. The field where this trial was planted is not very well drained. The seed used in this trial contains the 1c gene and is rated 4 on a scale of 9 for field resistance; thus, the variety is only partially resistant to the disease.

There were four replications of three treatments — two rates of Apron fungicide and a control. Maxim, a seed-treatment fungicide to control soilborne and seed-borne diseases, at a rate of 0.08 oz. per 100 lbs. seed, was also added to the Apron-treated seed. The seed treatment was applied to the seed by Novartis prior to bagging. Experiment design was a complete randomized block design. Individual treatment plots were 12 rows (30 ft.) wide and 880 feet in length. Soybeans were planted with a Buffalo slot planter. Soybeans were uniform but somewhat slow to emerge and did not grow very rapidly during May and early June. There was not a significant amount of rainfall for two weeks after planting, but adequate soil moisture and subsequent rainfall permitted seeds to germinate and grow without too much stress throughout the growing season.

Results

Treatments	Yield (bu/A)
Apron (0.41 oz./100 lb. seed)	44.5
Apron (0.16 oz./100 lb. seed)	45.9
No seed treatment	44.5
Significance P =0.05 F <1, CV = 4.2%	NS

Summary

In this particular trial, there was no benefit in using a seed treatment at either the high or low rate of Apron. This could have been due to a low amount of Phytophthora in the soil, partial disease resistance of the variety, or environmental conditions in that field this year that did not favor significant development of the disease.

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Soybean Inoculate and Seed Treatment

Dennis Baker, Extension Agriculture and Natural Resources Agent

Objective

To compare soybean yields using USDA soybean inoculate, T322 root-growth stimulant, a combination of the two, and no treatment.

Background

Test Site:	Darke County Farm	Row Width:	30 in.
County:	Darke	Soil Test:	pH 6.3, P 37 ppm, K 145 ppm
Nearest Town:	Greenville	Fertilizer:	0-46-0 100 lb./A
Soil Types:	Patton silty clay loam		0-0-60 125 lb./A
	Brookston silty clay loam	Herbicides:	PRE – Roundup (1 qt./A)
	Crosby silt loam		POST – Roundup (1.5 pt./A)
	Miami silt loam	Variety:	Pioneer 93B81
Drainage:	Subsurface	Seeding Rate:	247,500 seeds/A
Tillage:	No-till	Planting Date:	May 14, 2000
Previous Crop:	Corn	Harvest Date:	October 10, 2000

Methods

These plots were planted in two fields, both where corn had been grown the previous year. Soil types, drainage, and fertility levels are similar in both fields. Plots were planted and analyzed in a complete randomized block design. There were five replications of the treatments. Individual treatment plots were 12 rows (30′) wide with lengths of 1,515 feet in one field and 1,035 feet in the other.

Soybeans were planted with a Buffalo slot planter. Treatments were applied to the soybeans in the planter box. There was no significant amount of rainfall for two weeks after planting, but adequate soil moisture and subsequent rainfall permitted seeds to germinate. Growing conditions were adequate through the rest of the season.

Results

Treatments	Yield (bu/A)
T322	38.1
Soil Inoculate	38.4
T322 + Inoculate	39.3
No Treatment	39.5
Significance *P* =0.05	NS
F <1, CV = 7.6%	

Summary

Recent research has indicated a yield increase in soybeans when using one of the newer soybean inoculates, even when soybeans have recently been grown in the specific field. A newer product, T322, is also being advertised as stimulating root growth, thereby increasing yield. Some independent research has been done that would seem to verify this claim.

In this particular trial, there was no benefit in using either the USDA inoculate or the T322 root-growth stimulant. One explanation of lack of results from use of these products may have been soil moisture. Additional soil moisture soon after planting may have helped either of these products stimulate additional yield. Another consideration may be formulation used or how the material was applied. A good coating of each seed is important for both these materials to work. Perhaps a slurry formulation or addition of water to the soybean seed as the powdery material was applied could have made a difference.

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Effect of Inoculants on Soybean Yields

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent
In cooperation with Morrow County Soil and Water Conservation District

Objective

To evaluate the effect of two inoculants on soybean yields.

Background

Site:	Morrow County Home Farm
Nearest Town:	Mt. Gilead
Major Soil Type:	Centerburg silt loam
Drainage:	Randomly tiled
Tillage:	No- Till
Previous Crop:	Corn
Soil Test:	pH – 6.7 P - 52 ppm K - 169 ppm CEC – 8.0 meq/100g
Variety:	Golden Harvest 93706 RR
Planting Date:	May 15, 2000
Seeding Rate:	235,600 seeds/A
Row Width:	10 inches
Fertilizer:	None
Herbicides:	PRE – Canopy (3 oz./A), 2,4-D Ester (1 pt./A) POST – Roundup Ultra (1 qt./A) plus AMS
Harvest Date:	October 16, 2000

Methods

This study compared two relatively new soybean inoculants (CellTech 2000 and USDA Rhizo Stick). The study was three side-by-side comparisons. The individual treatment plots were 30-feet wide, and the harvested area was the center 20 feet of each plot and measured approximately 1/4 acre in size. The plots were all weighed with a weigh wagon. The soybeans were inoculated as directed by the manufacturer. One treatment was planted, then the drill was cleaned out completely with a shop vac and a second treatment was completed.

Results

Inoculant Treatments	Yield (bu/A)
Cell Tech	48.0
USDA Rhizo Stick	47.7
$F < 1$, $P = 0.05$	NS
CV	4.2%

NS = Not Significant

Summary

The soybeans were clean of weeds and looked good. There was no significant difference in yields between the two treatments.

Acknowledgment

The author would like to thank Golden Harvest for its donation of seed used in this study. Also, thanks to Royster Clark for donating the inoculants used. And thanks to the Morrow County Commissioners for the donation of land for this study.

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Food-Grade Soybean Evaluation Trial

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Farm Focus / Research Coordinator

Objective
To compare several food-grade (FG) soybean varieties vs. two popular conventional (C) soybean varieties.

Background

Cooperator:	Marsh Foundation / Farm Focus	Fertilizer:	125 lbs. / A 0-0-60 fall applied
County:	Van Wert	Soil Test:	pH 6.3, P 86 ppm, K 235 ppm
Nearest Town:	Van Wert	Herbicide:	PRE – Steel (3 pt. / A) + Canopy (2 oz. / A)
Soil Type:	Hoytville silty clay loam	Row Spacing:	15 inch
Drainage:	Tile	Planting Rate:	176,000 seeds / A
Previous Crop:	Corn	Planting Date:	May 31, 2000
Tillage:	Fall deep-tilled, spring field cultivate (2x)	Harvest Date:	October 12, 2000

Methods

This study was conducted using three replications of each soybean variety in a complete randomized block design. Plot size was 27.5-feet wide by 420-feet long, allowing for one round of the combine at harvest. Variety selection was based on local usage. Plots were planted using a John Deere MaxEmerge planter with a splitter attachment to obtain a 15-inch row spacing. The plots were evaluated for final stand populations on the harvest date, yield (weigh-wagon weights), and laboratory analysis for crude protein and oil content. Population counts were taken at three locations in each plot using a 17.5 feet distance and counting the plants in the rows on both sides of the tape. All yield, protein, and fat contents were adjusted to a 13% moisture standard.

Results

Mean harvest populations, yields, and laboratory analysis results for each variety are given in the table on the following page.

Summary

This study indicated significant differences in the final stand populations for the different varieties. This is most likely caused by the wide variations in seed size, since the same seed ing rate setting was used for all varieties. Proper seeding rate settings are important when planting typically larger food-grade seed.

Variety	Population (plants/A)	Yield (bu/A)	Protein % @13%moist	Fat % @13%moist	Seed Size seeds/lb
Pioneer 93B01 (C)	178,600 a	61.0 ab	35.79 c	19.05 a	3,488 e
Public Sandusky (C)	117,600 b	62.9 a	34.20 d	19.52 a	2,824 d
LG Seed C9275HP (FG)	109,100 bc	51.4 e	40.20 a	16.67 d	2,456 b
Agracola Farms AF271 (FG)	104,900 c	59.8 abc	40.18 a	16.61 d	2,584 c
Wellman Seed-Kohaku (FG)	102,400 c	55.9 cd	37.54 b	18.15 b	2,752 d
Ohio FG-1 (FG)	77,300 d	57.4 bcd	37.67 b	17.16 c	2,072 a
LSD (*P*=0.05)	9,400	4.3	0.31	0.47	98
CV (<15% is credible)	4.5%	4.1%	0.5%	1.5%	2.0%

Means with the same letter are not significantly different at $P = 0.05$.

With the large variations experienced in the final stand populations, it is difficult to draw definite conclusions as to the differences in yield, and whether these yield differences were the result of the seeding-rate variation or the variety of soybean. This study would need to be repeated again, paying particular attention to having the same seeding rate for each individual variety for yield comparisons. Another important consideration is to account for germination rates. Despite not accounting for these factors, there appears to be little yield lag with food-grade soybeans.

Protein and fat content results for the varieties are listed because buyers of food-grade soybeans use the protein content as an indicator of the quality of product they can expect from that particular variety. High protein content is a major consideration in developing food-grade varieties. As the table indicates, all the food-grade varieties had significantly higher protein than the conventional varieties. Typically, fat content is inverse to the protein content, as can be seen in the results. Seed size is another characteristic that is often considered by the buyer, with the larger seed size usually being more desirable. There were statistically significant differences in the seed sizes. This is based on the number of seeds per pound after being screened (using a 12/64 inch x 3/4 inch slotted screen) to remove splits and foreign material.

Acknowledgment

The authors wish to express their appreciation to Agracola Farms, LG Seed, Pioneer Hybrids, and Wellman Seed for donating the seed used in this study.

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Effect of Early Planting on No-Till Soybean Yield

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

Planting soybeans early helps to spread out the spring workload for producers. The objective of this study was to determine the effect of early planting on yields of no-till soybeans.

Background

Cooperator:	Tom Weiler
County:	Morrow
Nearest town:	Chesterville
Drainage:	Random tile, well-drained
Soil Type:	Chili loam
Tillage:	No-till
Previous Crop:	Corn
Variety:	Callahan 8367RR
Soil test:	pH 6.7, P 30 ppm, K 123 ppm
Fertilizer:	None
Planting Date:	See Methods
Planting Rate:	217,500 seeds / A
Harvest Date:	October 12, 2000
Herbicides:	PRE - Canopy (3 oz. / A), POST – Roundup Ultra plus AMS (1qt. / A)
Row width:	30 inch

Methods

Four planting dates were planned, but rains in late March prevented a late March planting date. Three dates (April 6, April 26, and May 8) were used. The plot was replicated four times in a complete randomized block design. Each treatment plot was 30-feet wide and approximately 2,000 feet long. The center 20 feet of each plot were harvested and weighed with a weigh wagon.

Results

Planting Date	Yield (bu/A)
April 6	41.0 ab
April 26	42.5 a
May 8	39.1 b
LSD (0.05)	2.3
CV	4.1%

Means followed by the same letter are not significantly different.

Summary

Yields from the April 26 planting were significantly better than those from the May 8 date. However, the two April dates did not produce significant differences in yield.

This is the third year the late March / April planting dates have provided favorable results. We have selected well-drained fields and used a soybean with a good, protective seed treatment each year. The results appear to support the idea that soybeans can be planted in late March and in April before corn planters are taken to the field. This expands the days available for spring planting activities.

Acknowledgment

Thanks to Royster Clark and Callahan Seeds for providing the soybeans used in this study.

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Emergence of Polymer-Coated Soybeans Using a Very Early Planting Date

Steve Prochaska, Extension Agriculture and Natural Resources Agent

Objective

To evaluate the emergence of a soybean variety with two types of polymer coatings when planted early.

Background

Test Site:	The Ohio State University Unger Farm	Fertilizer:	0-50-50 actual lbs (N-P_2O_5-K_2O)/A
County:	Crawford	Variety:	Huber 323
Soil Type:	Blount silt loam	Herbicides:	Roundup (1 qt/A) and Boundary (1 qt/A) applied 4/19/00
Tillage:	No-till		
Previous Crop:	Corn		
Soil Test:	pH 6.9, P 31 ppm, K 122 ppm	Seeding Rate:	207,570 seeds/A
Row Width:	7.5 inches	Planting Date:	April 1, 2000

Methods

A completely randomized design with three treatments and five replications was used. Treatments were two types of polymer coatings and a non-coated treatment. These coatings made of biodegradable materials were designed to delay germination of the soybean seed. The coatings A and C were described as being able to delay germination and protect the seed from pathogens from one to two weeks respectively. The same soybean variety was used for all treatments. A 15-foot International no-till drill was used to plant the treatments. Each treatment plot was 10 rows wide with a length of 325 feet (varied slightly). Four stand counts were taken on June 20, 2000, in each replicate using a 36-inch hula-hoop randomly tossed in the plot.

Results

Treatments	Emergence (plants/A)
Coating A	57,536
Coating C	57,288
No Coating	52,390
F <1 CV = 18.3%	NS

Summary

Soybeans with Coating A emerged about one week slower than the control treatment. Soybeans with Coating C were two weeks slower in emerging than the control. Plant stand counts 11 weeks after planting were not significantly different among the three treatments. Results indicate no benefit to the use of either polymer coating treatment.

Ohio State University agronomists recommend a final soybean population of 105,000 plants per acre. Bean leaf beetles damaged plots throughout the test area. Stand counts for all treatments were unacceptable to obtain representative yields. To that end, soybean yield data were not taken.

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Soybean Planting Population Rate Evaluation

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent

Objective

To evaluate the response of different soybean planting population rates in a 10-inch row width system.

Background

Cooperator:	Agracola Farms
County:	Van Wert
Nearest Town:	Van Wert
Soil Type:	Blount silt loam
Drainage:	Systematic
Previous Crop:	Corn
Tillage:	None
Fertilizer:	None applied
Row Spacing:	10 inch
Herbicide:	
PRE (4/26/00):	Authority (7 oz./A) + 2, 4-D Estron (8 oz./A)
POST (6/28/00):	Poast Plus (20 oz./A) + Pinnacle (0.1 oz./A)
Variety:	Pioneer 92B61
Seeding Rates:	See treatments
Planting Date:	May 6, 2000
Harvest Date:	September 19, 2000

Methods

A study using three replicates in a randomized complete block design was established to determine the effect of seeding rate on yields in a 10-inch row width system. Seeding rate treatments were 144,000, 180,000, and 212,000 seeds per acre. Plots were 138 feet wide and a minimum of 2,342 feet long. Soybeans were planted with a White 6300 planter. The center 58 feet of each plot were harvested and weighed, and grain yield was adjusted to 13% moisture. Harvest populations were estimated by counting the number of plants in three 13-foot sections from two adjacent rows. Counts were made at three different locations in each plot.

Results

Average yields and harvest populations for each treatment are given here:

Treatment	Harvest Population		Yield
	—— plants/acre ——		—— bu/acre ——
144,000 seeds/A	117,277	A	40.4
180,000 seeds/A	141,849	B	41.8
212,000 seeds/A	162,847	C	41.7
LSD ($P = 0.05$)	5,249		NS
CV	1.7%		4.9%

Means with the same letter are not significantly different. Yield differences were not significant at $P = 0.05$.

Summary

As seen in this study, planter settings can be a variable with regards to comparing target-seeding rates with final harvest populations. Germination rates can also be a factor as final stands were approximately 80% of target seeding rates. Populations were statistically different between the means of all three treatments. There were no significant differences among the three yield means.

In conclusion, data from this one-year study suggests that there were three distinct soybean populations in this study that did not produce significant reductions or increases in yield.

Acknowledgment

The author expresses appreciation to Agracola Farms for their cooperation in this study.

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Seeding Rates for Roundup Ready Soybeans

Steve D. Ruhl, Extension Agriculture and Natural Resources Agent
Ed Lentz, Extension Agronomy Specialist

Objective

To evaluate the effect of seeding rate on yield of Roundup Ready soybeans.

Background

County:	Morrow
Nearest town:	Mt. Gilead
Soil type:	Centerburg silt loam
Drainage:	Random tiled
Previous Crop:	Corn
Tillage:	No-till
Fertilizer:	None
Soil Test:	pH 7.0, P 44 ppm, K 90 ppm
Herbicides:	
PRE:	Canopy (3 oz/A), 2,4-D (1 pt/A)
POST:	Roundup Ultra (1 qt./A), and AMS
Variety:	Vigoro - V370RR
Planting Date:	May 15, 2000
Planting Rate:	See table
Harvest Date:	October 16, 2000

Methods

Three population rates were used to determine the effect of seeding rate on yields. They were 100,000, 160,000 and 240,000 seeds per acre. The treatments were replicated three times in a complete random block design. Individual plot size was approximately 0.5 acre. The beans were planted in 30-foot strips, and a 20-foot wide strip was harvested and weighed using a weigh wagon.

Results

Seeding Rate (seed/A)	Harvest Population (plants/A)	Yield (bu/A)
100,000	83,000	46.3 a
160,000	109,000	48.9 b
240,000	161,000	49.6 b
LSD (0.05)		2.2
F = 9.1, CV = 2.0%		

Means followed by the same letter are not significantly different.

Summary

Following the drill's seeding chart, we planted 27 pounds of seed per acre to achieve the lowest seeding rate desired. The seed quality did not look good despite labels indicating 90% germination. According to the seed and plant mortality at the higher rates, the lowest rate came closest to target population.

All the plots were exceptionally clean, and a uniform stand was achieved on all of the plots. The 240,000 and 160,000 seeding rates achieved significantly higher yields than the 100,000 seeding rates.

It appears through this study that final stands above 100,000 plants are needed to get maximum yields. Producers need to calculate the cost of seed per acre at the higher rates and determine if returns from the additional yield offset the additional cost of seed.

Acknowledgment

The author would like to thank Royster Clark and Vigoro for furnishing the soybeans for this study. Also, we appreciate the collaboration of the Morrow County Commissioners for the use of 20 acres of land for plots at the County Home Farm and the collaboration of Dan Barker, Soil and Water Conservation District administrator.

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Roundup Ready Soybean Population Study — Sandusky

Mark Koenig, Extension Agriculture and Natural Resources Agent
Edwin Lentz, Extension Agronomy District Specialist

Objective

To evaluate the response of Roundup Ready soybeans to different seeding rates.

Background

Cooperator:	David Sachs
County:	Sandusky
Nearest Town:	Fremont
Soil Type:	Kibbie Fine Sandy loam
Drainage:	Tile
Previous Crop:	Corn
Tillage:	No-till
Fertilizer:	None applied
Herbicide:	EPOST - Roundup Ultra (2 pt/A)
Variety:	Dekalb 285
Seeding Rates:	See treatments
Planting Date:	April 28, 2000
Harvest Date:	September 29, 2000

Methods

A study using four replicates in a randomized complete block design was established to determine the effect of seeding rate on Roundup Ready soybean yields. Seeding rate treatments were 110,000, 165,000, and 220,000 seeds per acre. Plots were 45-feet wide x 3,032-feet long. Soybeans were planted with a John Deere 750 no-till drill. A Case-IH 2366 combine was used to harvest the center 25 feet of each plot. Weights were estimated by an Ag Leader 3000 yield monitor. The average size of the harvested plot was 1.74 acres. Harvest populations were estimated by counting the number of plants in three-foot sections from six adjacent rows. Counts were made at three different locations in each plot.

Results

Treatment	Yield	Harvest Population
--seeds/A--	--bu/A--	--plants/A--
220,000	51.9 a	189,898 a
165,000	48.6 ab	148,635 b
110,000	43.5 b	114,390 c
LSD (0.05)	6.4	18,137

Means followed by the same letter are not significantly different.

Summary

Drill settings for this study were determined by using seed tag information as to seeds per pound, and then the drill was set for pounds per acre to get the desired population. Seeding rates included a 10% germination loss. The low-end population was within 3% of the desired population whereas the other desired populations were 90% and 85% of desired results. It must be noted that this area received several heavy rains and had water damage to certain areas within the plot.

The high-end seeding rate had yields statistically similar to the middle seeding rate, and 21% larger than the low-end seeding rate. The two lower seeding rates were also statistically similar. Significant differences among the harvest populations validate differences among seeding rate treatments.

This data would support a seeding rate of 165,000 seeds per acre without lowering yields, a cost savings of 55,000 seeds per acre. Yield reductions may occur at the low-end seeding rate.

Acknowledgment

We would like to express our appreciation to Dave Sachs for assisting with the study. This was a very large plot, and without Dave's assistance, this study would not have been possible. It also represents a total field with any differences being seen across the total test.

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Roundup Ready Soybean Population Study — Van Wert

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Gary Prill, Farm Focus/Research Coordinator

Objective

To evaluate the yield response of Roundup Ready soybeans to different seeding rates in order to reduce seed costs by finding an optimum seeding rate.

Background

Cooperator:	Marsh Foundation/ Farm Focus	Herbicide:	BURNDOWN — Touchdown 5 (2 pt./A) + AMS (3 lbs./A) POST — Touchdown 5 (2 pt./A) + AMS (3.4 lbs./A)
County:	Van Wert		
Nearest Town:	Van Wert		
Soil Type:	Hoytville silty clay loam	Variety:	Seed Consultants SC9320RR (treated)
Drainage:	Tile (system unknown)		
Previous Crop:	Corn	Seeding Rates:	See Methods
Tillage:	No-till drilled	Row Width:	7.5 inches
Fertilizer:	30 lbs./A 0-0-60 fall applied	Planting Date:	May 17, 2000
Soil Test:	pH 6.4, P 88 ppm, K 166 ppm	Harvest Date:	October 3, 2000

Methods

This study was conducted using three replications of three different seeding rates (110,000, 165,000, and 220,000 seeds per acre) in a complete randomized block design. All plots were planted using a John Deere 750 no-till drill calibrated with the same seed used in the treatments. Plot size was 28.75 feet wide by 1,030 feet long. Population counts were taken at three locations in each plot using a 17.5-feet distance and counting the rows on both sides of the measure. Yields were taken at harvest using a calibrated weigh wagon, with all yields being adjusted to 13% moisture.

Results

Treatment	**Harvest Population**	**Yield**
(seeds/A)	(plants/A)	(bushels/A)
110,000	79,900 a	61.5 a
165,000	127,000 b	63.2 ab
220,000	145,800 b	65.0 b
LSD (*P*=0.05)	26,800	2.4
CV (<15%=credible)	10.1%	1.7%

Means with the same letter are not significantly different at *P*=0.05

Summary

The data from this year show that the two higher seeding rate treatments had a statistically significant yield increase over the lowest rate treatment. This is the second year for the study at this location. Results from both years would indicate that higher seeding rates provide a statistically significant yield increase. However, this yield increase may not cover the cost of the additional Roundup Ready seed used at these higher rates.

Even with the drill calibrated for the specific seed used in the experiment, it is evident that large variations in final stand counts will be experienced when using a drill for seeding soybeans. It is also interesting to note the large difference between seeding rates and the harvest population stand counts. This difference was present in almost all of the research plots at Farm Focus this year. This most likely can be attributed to the cool wet conditions in the spring that delayed planting and emergence, and to the reduced seed quality this past year.

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Optimal Seeding Rate of Roundup Ready Soybeans — Wyandot

Chris Bruynis, Extension Agriculture and Natural Resources Agent

Objective

To determine the optimal economic seeding rate for Roundup Ready soybeans

Background

Cooperator:	Dean Koehler	Soil Test:	pH 6.5, P 38 lbs./A K 233 lbs./A, OM 2.4%
County of Site:	Wyandot	Fertilizer:	None
Nearest Town:	Upper Sandusky	Herbicide:	Round-Up Ultra (32 oz./A) applied 6/27/00
Major Soil Type:	Blount silt loam	Planting Rate:	See Methods
Drainage:	Surface—Minimal Tile	Row Width:	9 inches
Tillage:	No-Till	Planting Date:	May 13, 2000
Previous Crop:	Corn	Harvest Date:	October 11, 2000
Variety:	Callahan 3505		

Methods

With seed cost differences between Roundup Ready seed and traditional soybean seed, the importance of seeding rate has increased. Higher than necessary seeding rates impact profitability. A 30-foot John Deere Air Seeder with seed monitors was used for planting into corn stubble. The three targeted seeding rates were 100,000, 150,000, and 200,000 seeds per acre. Experimental design was complete randomized block with four replications. Each of the treatment plots was 30 feet wide and 494 feet in length. Yield was measured by a weigh wagon.

Results

Target Population (plants/A)	Harvest Population (plants/A)	Yield (bu/A)
100,000	98,252 a	46.4 b
150,000	144,716 b	49.3 a
200,000	175,934 c	49.6 a
F	33.1	10.6
LSD (0.05)	23,506	2.4
CV	9.7%	2.2%

Means followed by the same letter are not significantly different.

Summary

Analysis of the data reveals that each harvested population range is statistically different from each other. Harvested yields of the two highest plant populations were not significantly different from each other. The lowest population yield was significantly lower than the higher two planting rates.

Field conditions during the growing season were generally good with adequate moisture. There was a little water stress early in the season. There was no noticeable difference in weed control in any of the replications with the entire study having excellent weed control.

The economic difference among the three treatments, assuming a $5.40 value for soybeans (includes Loan Deficiency Payment) and a $22.00 cost for seed beans (50-pound bag @ 2,800 seeds per pound), and using 150,000 seeds per acre as optimum, is as follows:

Seeding Rate (seeds/A)	Difference in Seed Cost ($)	Difference in Sales ($)	Net Difference in Profit per Acre
200,000	+ 7.85	0	$ 7.85 less
100,000	- 7.85	+ 16.17	$ 8.32 less

According to these results, growers can have a profitability change of $8.00 per acre by choosing the correct seeding rate for Roundup Ready soybeans. For a grower producing 500 acres of soybeans, this would result in additional income of $4,000 for reducing seeding rate from 200,000 per acre to 150,000 per acre. These differences are based on one location and one growing season. Additional sites and years of data will better define the optimal plant population for Roundup Ready soybean profitability.

Acknowledgment

The author would like to thank Farmers Commission Company for providing a weigh wagon for this trial.

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The Effects of Seeding Rate on White Mold in Soybeans

Edwin Lentz, Extension District Specialist, Agronomy
Glen Arnold, Extension Agent, Agricultural and Natural Resources
Anne Dorrance, Extension State Specialist, Soybean Pathologist

Objective

To evaluate the response of white mold in soybeans to seeding rate.

Background

Cooperator:	Dan Heitzman
County:	Putnam
Nearest Town:	Dupont
Soil Type:	Colwood/Lenawee loam/silty loam
Drainage:	Tiled
Previous Crop:	Corn
Tillage:	None
Soil Test:	(1999) pH 6.3, P 50 ppm, K 150 ppm
Fertilizer:	120 lb/A K_2O applied fall 1999
Variety:	Sandusky
Seeding Rates:	See treatments
Row Width:	15 inches
Herbicide:	Roundup Ultra burndown (1 qt/A); Classic (0.33 oz/A), Flexstar (1 pt/A), and Poast Plus (1.5 pt/A) on July 14
Planting Date:	June 4, 2000
Harvest Date:	October 11, 2000
Seed Treatment:	Bin run seed, treated with a regular rate of Rival and a half rate of Apron.

Methods

Experimental design was a randomized complete block with four replications. Treatments were three seeding rates — 110,000, 165,000, and 220,000 seeds per acre. Plots were 32.5 feet wide x 1,201.2 feet long. Soybeans were planted with a White 6100 planter with a splitter attachment. The center 20 feet (16 rows) of each plot were harvested by a Gleaner L3 combine. A 1993 custom-made weigh wagon with an Artsway 700E Digital scale was used for grain weights. Harvest populations were estimated by counting plants from four adjacent rows in 25-foot sections.

Results

Even though this field has a history of white mold, environmental conditions in 2000 were not conducive for disease development. Thus, the results only discuss the relationship between yield and seeding rate. These observations are given in the table on the following page.

Seeding Rate	Yield (@13%)†	Harvest Population†
lb/A	**bu/A**	**plants/A**
220,000	50.9 a	147,320 a
165,000	48.4 ab	113,648 b
110,000	46.8 b	83,897 c
LSD (0.05)	2.7	4,748

†Means with the same letter are not statistically different.

Summary

Stands were reduced approximately 30% from seeding to harvest, but populations were statistically different among all treatments. Seed quality may have caused stand reduction. The seed used in this experiment had a warm germination test score of 90%, but a cold test was not performed. Many 1999 seed lots had cold test scores that were much lower because of seeds damaged from harvesting and disease. In some cases, handling from treating seeds with fungicide may have caused additional germination losses. It was not uncommon for 1999 soybean seed lots to have emergence rates as low as 60–70%.

Even with the stand reduction, yields were statistically similar between the upper and middle seeding rates. Yield differences were only detected between the upper- and lower-end seeding rates (upper-end seeding rate yielded 9% more, approximately 4 bushels). The two lowest seeding rates had similar yields.

This data would suggest no advantage for seeding rates larger than 165,000 seeds per acre at 15-inch row spacing. Some yield reduction may be expected if harvest populations drop below 100,000 plants per acre.

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Evaluation of Herbicide Programs Using Roundup Ready Soybeans

Steve Ruhl, Agriculture and Natural Resources Extension Agent
Jeff Stachler, Horticulture and Crop Science Extension Associate

Objective

The adoption of Roundup Ready (RR) soybeans has been rapid. It is reported that 60 percent of the soybeans planted in the United States are RR. There are numerous herbicides that can be used with Roundup to extend the window of application, provide residual control, or improve control of certain weed species. This plot was designed to evaluate several different herbicide combinations with and without Roundup in comparison to a Roundup only program.

Background

Cooperator:	Tom Weiler	Fertilizer:	None
County:	Morrow	Soil Test:	pH = 7.0
Nearest Town:	Chesterville		P = 23 ppm
Soil type:	Sloan silty clay loam		K = 154 ppm
Drainage:	Systematic	Herbicide:	See Table
Previous Crop:	Corn	Variety:	Pioneer 93B01 RR
Tillage:	Conventional	Planting Date:	May 8, 2000
Row Spacing:	10 inch	Planting Rate:	210,000 seeds/A
		Harvest Date:	October 12, 2000

Methods

The field chosen has moderate to high giant ragweed pressure, moderate giant foxtail pressure, and low to moderate common lambsquarters pressure. Eleven different herbicide treatments and an untreated check were replicated four times in a randomized complete block design. Plot size was 10 feet wide by 40 feet in length. The preemergence herbicides were applied on May 8, 2000; the postemergence herbicides were applied on June 6, 2000; and a second postemergence application of Roundup for one treatment was applied on July 18, 2000. Weed control was visually evaluated on August 17, 2000.

Results

The table on the following page shows the treatments, cost, and weed control for study.

Herbicide Treatment[a,b]	Rate[b]	Treatment Timing[b,c]	Weed Control[d]			Herbicide Cost[e]	Total Cost[f]
			Annual Grass	Common Lambsquarters	Giant Ragweed		
			%	%	%	$	$/A
Canopy	3.0 oz/A	PRE				6.75	
Roundup Ultra +	1.5 pt/A	POST	99 a	99 a	94 ab	6.75	31.99
AMS	17#/100 gal	POST				0.61	
Domain	12.0 oz/A	PRE				8.44	
Roundup Ultra +	1.5 pt/A	POST	99 a	95 ab	89 ab	6.75	33.68
AMS	17#/100 gal	POST				0.61	
Boundary	1.25 pt/A	PRE				11.88	
Roundup Ultra +	1.5 pt/A	POST	94 b	78 b	86 abc	6.75	37.12
AMS	17#/100 gal	POST				0.61	
Roundup UltraDry +	1.2 #/A	POST	97 ab	55 c	90 ab	11.43	25.92
AMS	17#/100 gal	POST				0.61	
Roundup Ultra +	1.5 pt/A	POST				6.75	
AMS	17#/100 gal	POST	100 a	100 a	99 a	0.61	34.85
Roundup Ultra +	1.0 qt/A	POST2				9.0	
AMS	17#/100 gal	POST2				0.61	
Extreme +	3.0 pt/A	POST				11.58	
NIS +	0.125 %v/v	POST	99 a	87 a	91 ab	0.19	26.37
AMS	2.5 #/A	POST				0.45	
FirstRate +	0.3 oz/A	POST				6.36	
Roundup Ultra +	1.5 pt/A	POST	100 a	91 ab	95 ab	6.75	27.60
AMS	17#/100 gal	POST				0.61	
Cobra +	8.0 oz/A	POST				7.59	
Roundup Ultra +	1.0 qt/A	POST	99 a	94 ab	92 ab	9.00	31.08
AMS	17#/100 gal	POST				0.61	
Canopy +	3.0 oz/A	PRE				6.75	
Dual II Magnum	1.67 pt/A	PRE				17.32	
FirstRate +	0.3 oz/A	POST	96 ab	100 a	65 cd	6.36	41.68
MSO +	1.2 %v/v	POST				2.88	
UAN	2.5 %v/v	POST				0.37	
Canopy	3.0 oz/A	PRE				6.75	
Flexstar +	1.3 pt/A	POST				13.00	
Select +	8.0 fl. oz/A	POST	100 a	94 ab	74 bcd	10.62	41.14
MSO +	1.0 %v/v	POST				2.40	
UAN	2.5 %v/v	POST				0.37	

Herbicide Treatment[a,b]	Rate[b]	Treat-ment Timing[b,c]	Weed Control[d] Annual Grass	Common Lambs-quarters	Giant Ragweed	Herb-icide Cost[e]	Total Cost[f]
			%	%	%	$	$/A
Authority	3.0 oz/A	PRE				7.05	
FirstRate +	0.3 oz/A	POST				6.36	
Select +	5.0 fl. oz/A	POST	99 a	74 bc	61 d	6.64	31.30
MSO +	1.2 %v/v	POST				2.88	
UAN	2.5 %v/v	POST				0.37	
LSD (0.05)			4.6	21.4	22.2		

[a] All treatments applied at 20 gallons per acre and 30 psi.
[b] Abbreviations: AMS = ammonium sulfate, NIS = nonionic surfactant, MSO = methylated seed oil, UAN = urea ammonium nitrate (28% N), oz = ounce, pt = pint, A = acre, # = pound, gal = gallon, qt = quart, % v/v = percent volume to volume, fl. oz = fluid ounces, PRE = preemergence, POST = postemergence.
[c] The PRE treatments were applied on May 8, 2000, and a total of 4.6 inches of rainfall was measured between May 8 to May 31. The POST treatments were applied on June 6, 2000, when the annual grasses were two- to four-inches tall, giant ragweed was 12- to 18-inches tall, and soybeans were at the V-3 stage of growth. The POST2 treatment was applied on July 18, 2000.
[d] Treatments means followed by the same letter are not significantly different, and visual evaluation of weed control was done on August 17, 2000.
[e] All herbicide and adjuvant costs listed in the table were the 2000 in-season retail prices.
[f] The total cost includes an application cost of $4.00 per application, and a Roundup Ready Technology Fee of $9.88 per acre if Roundup was applied postemergence.

Summary

Only Roundup Ultra followed by Roundup Ultra and Canopy followed by Roundup Ultra provided greater than 93% control of all three species. All treatments provided excellent giant foxtail control. Most treatments provided good to excellent control of common lambs-quarters, except Boundary followed by Roundup Ultra, Roundup UltraDry, and Authority followed by FirstRate plus Select, all of which provided significantly lower control. Most treatments provided good to excellent control of giant ragweed, except Canopy plus Dual II Magnum followed by FirstRate, Canopy followed by Flexstar plus Select, and Authority followed by FirstRate plus Select. The poorer control with the two treatments containing FirstRate may be due to the presence of ALS-resistant giant ragweed. The poorer control with the treatment containing Flexstar was caused by too large of giant ragweed at the time of application. The slightly lower control of giant ragweed for the treatments containing Domain and Boundary may be a result of too large of plants at the time of the postemergence application, since these two products are ineffective in controlling giant ragweed.

The benefit of the preemergence herbicides before Roundup is that the early season weed control helps to reduce weed competition and widen the window for the postemergence application. The benefit of tank-mixing residual herbicides with Roundup is to be able to make applications to small weeds and still provide later season weed control and provide improved control for certain weed species. The total cost per acre ranged from $25.92 to $41.68 per acre. The two-pass Roundup Ultra treatment cost $34.85 per acre.

Acknowledgment

We would like to thank Pioneer for donating the soybeans used in the project and thank Geoff Trainer, Ohio State University senior and Agronomy Team member, for evaluating the weed control.

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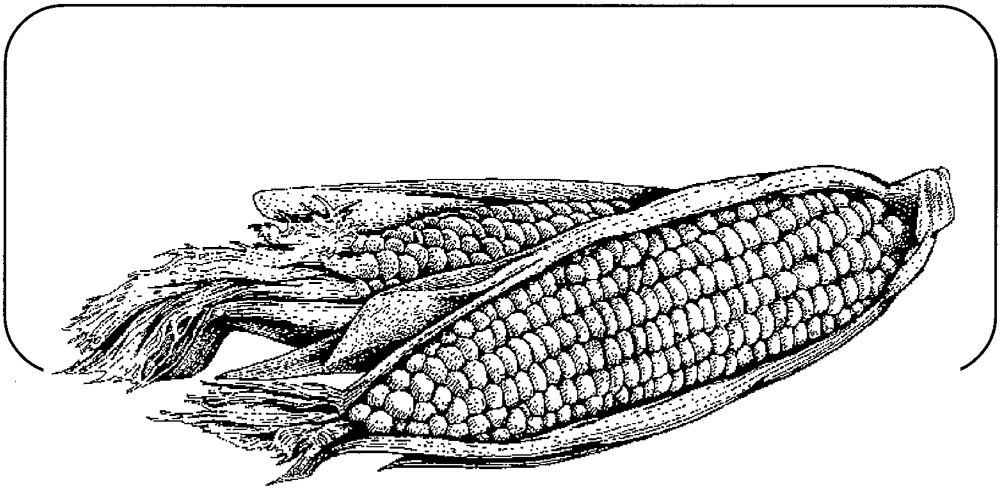
Corn



T-22 Biological Fungicide for Corn

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of the biological fungicide T-22 on corn yield.

Background

T-22 Planter Box is a recently available agricultural product containing the fungus *Trichoderma harzianum* which is stated to actively colonize and enhance plant roots. It is stated to help corn plants deal with drought stress.

Cooperator:	Tom Weiler
County:	Morrow
Nearest town:	Chesterville
Drainage:	Naturally well-drained
Soil Type:	Chili
Tillage:	Conventional Till
Previous Crop:	Soybeans
Variety:	Golden Harvest 2547
Soil test:	pH 6.5 P 104 ppm K 208 ppm

Fertilizer:	206-70-99 lb./A actual N, P_2O_5, K_2O
Planting Date:	May 1, 2000
Planting Rate:	30,100 seeds/A
Harvest Date:	October 23, 2000
Herbicides:	PRE – Dual II Magnum (1 qt./A), Atrazine (1.5 lb./A), Balance (1.0 oz./A) POST – Clarity (1pt./A)
Row width:	30 inch

Methods

A split planter box treatment of 1 oz. per acre of T-22 vs. no treatment was used in this study. The planter used was a six-row machine. The experimental design was a split-planter side-by-side strip trial with three replications. Three rows had T-22 applied and three rows had no treatment. Individual treatment strips were six rows (15 ft.) wide, and lengths ranged from 277 feet to 455 feet. All six rows of each treatment were harvested and weighed with a weigh wagon.

Results

Treatments	Yield (bu/A)
T-22	149.9
No treatment	145.5
Significance *P* =0.05	NS
F <1, CV = 4.0%	

Summary

The use of T-22 did not have a statistically significant effect on corn yield in this trial. Seed treatments often produce small changes in yield, thus more replications should have been added. The literature on T-22 advocates its real benefit as occurring during a drought year. The 2000 crop year was somewhat dry during periods of the season, but it certainly was not a drought year.

Acknowledgment

The collaborators on this trial express their thanks to Golden Harvest Seed Company for furnishing the seed corn and weighing the plots. Also, thanks are owed to Todd Swetland, Pioneer Seed dealer, for providing the T-22 product.

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Planting Rates for Determinate and Indeterminate Corn Hybrids

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of three different planting rates on yields of hybrids differing in ear growth habit.

Background

Cooperator:	Tom Weiler
County:	Morrow
Nearest town:	Chesterville
Drainage:	Naturally well-drained
Soil Type:	Chili loam
Tillage:	Conventional till
Previous Crop:	Soybeans
Varieties:	Pioneer 34G81 and Golden Harvest 2547
Soil test:	pH 6.5, P 104 ppm, K 208 ppm
Fertilizer:	206-70-99 lb./A actual N-P-K
Planting Date:	May 1, 2000
Planting Rate:	See Methods
Row Width:	30 inch
Harvest Date:	October 23, 2000
Herbicides:	PRE – Dual II Magnum (1 qt./A), Atrazine (1.5 lb./A), Balance (1.0 oz./A) POST – Clarity (1pt./A)

Methods

Three different planter rates (24,300, 30,100, and 35,700 seeds per acre) were replicated three times in a complete randomized block design study for each hybrid. Treatment plots for the determinate corn hybrid, Pioneer 34G81, averaged 626 feet in length, and plots for the indeterminate hybrid, Golden Harvest 2547, averaged 594 feet in length. All treatment plots were 12 rows wide. The treatment plots were harvested completely and weighed using a weigh wagon.

Results

The results are shown in the table on the following page:

Planting Rate (seeds/A)		Yield Pioneer 34G81 (bu/A)	Yield Golden Harvest 2547 (bu/A)
24,300		133.5	130.7
30,100		137.9	134.4
35,700		138.0	129.2
	F	3.5 - NS	<1 - NS
	CV	5.9%	1.9%

NS = Not significantly different at $P = 0.05$.

Summary

According to some seed companies, a "fixed-ear" hybrid is associated with a relatively determinate ear size that limits its potential to compensate for variation in plant population and growing conditions. In contrast, a "flex-ear" hybrid has a more indeterminate ear size, which can adjust for differences in plant population and environment.

This study showed there is no significant difference in yields on the three planting rates used in this one-year, one-location study. Yields were limited at this location in 2000 due to excessive rains in May through June while July through August weather was dry.

Acknowledgment

The author would like to thank the Golden Harvest Seed and Pioneer companies for their donation of the seed used in this study. Also, thanks to Golden Harvest for weighing the corn at harvest.

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Early Season Hail Damage in Corn: Effects of Stalk Bruising and Tied Whorls

Todd Mangen, Graduate Research Associate
Peter Thomison, Extension Agronomist, Corn

Objective

To determine effects of tied whorls and stalk bruising caused by early season hail damage on corn performance at four on-farm sites. Various agronomic performance parameters including yield, nubbin ears/barren plants, lodging, and silking/pollen shed dates were evaluated.

Background

Cooperator:	Pendleton	Seymore	Delay A	Delay B
Variety:	Pioneer 33J24	Davis 2711	Pioneer 33J24	Pioneer 33J24
Planting Date:	4/29/00	5/1/00	4/26/00	4/30/00
Planting Rate (seeds/acre):	29,900	26,000	29,000	29,000
Tillage:	Conventional	Conservation	Conventional	Conventional
Fertilizer applied N-P-K (lbs/A)	170-78-92	168-78-78	187-69-90	187-69-90
Previous Crop	Soybean	Soybean	Soybean	Wheat
Soil Type:	Crosby Silt Loam	Kokomo Silty Clay Loam	Miamian Silt Loam	Miamian Silt Loam

Methods

On June 5, 2000, a hail storm caused severe injury to corn fields in Fayette County, Ohio. Hail resulted in nearly complete defoliation as well as severe stalk bruising. A week after the hail injury occurred, a high percentage of plants exhibited tied whorls. While there is extensive information on defoliation effects on corn growth and agronomic performance, little information exists on effects of bruising and tied whorls on subsequent plant growth and survival.

On June 12, plots consisting of 30 feet of row, replicated eight times, were established at each of four on-farm sites. Plants were rated according to a predetermined scale using four different categories (normal growth, tied whorl, abnormal growth, and dead) on three dates following the hail injury. Plots exhibiting major damage were associated with extensive hail-induced stalk bruising and scarring, whereas plots with minor damage were associated with little or no stalk bruising. Plots with major damage were completely defoliated, whereas plots with minor damage exhibited 80 to 90% defoliation based on visual estimates.

Data was also recorded for plant heights, silking/pollen shed dates, barren plants (including plants with poorly developed ears), and lodging. Stalk lodging and barrenness were expressed as a percentage of final plant stand. On September 19, plots were hand harvested, and yields were adjusted to 15.5% moisture. It was not possible to randomize treatments because replicates were adjacent rows. Standard errors were computed for grain yield data to provide a measure of variability across replicates within treatments (plots with major and minor damage).

Results

	Pendleton		Seymore		Delay A		Delay B	
	Major	Minor	Major	Minor	Major	Minor	Major	Minor
Growth stage when damage occurred	V6		V5		V7		V5	
Leaves damaged[1]	100	90	100	80	100	90	100	90
Tied Whorls, %[2]								
12 June	53	20	56	44	36	40	61	22
23 June	24	6	6	1	13	9	8	5
6 July	9	3	0	0	6	7	1	2
Canopy Height (in.)								
12 June	11.0	14.0	4.9	12.8	24.6	23.4	12.0	33.6
23 June	33.6	45.6	14.7	23.8	38.7	41.2	28.1	52.0
6 July	64.9	79.7	37.3	53.5	69.9	73.7	62.7	93.3
Silking, %[2]								
13 July	-	-	0	0	-	-	32	86
18 July	-	-	12	31	-	-	63	100
21 July	-	-	32	71	-	-	77	100
25 July	-	-	58	90	-	-	84	100
1 August	-	-	85	100	-	-	-	-
Final Stand (plants/A)	28895	28895	16408	23087	26717	26572	25846	26717
Barren Plants, %[2]	12.3	8.5	18.8	5.0	13.8	11.3	16.8	10.8
Lodging, %[2]	1.5	0.5	0.0	0.8	0.5	0.5	0.5	0.5
Grain Moisture, %	21.3	18.9	28.9	25.7	18.9	19.2	21.3	19.6
Yield (Bu/A)	159.8	194.1	93.3	186.5	164.8	176.7	147.5	169.5
S.E. (yield)	4.8	10.1	11.8	3.0	10.0	7.8	10.8	12.3

[1] Visual estimate percent.
[2] Percentage of final stand.

Summary

During the three- to four-week period following the hail storm, the number of plants exhibiting tied whorls decreased. Plots that received major damage from hail exhibited 36 to 61% tied whorls on June 12, which decreased to 0 to 9% by July 6. Also, canopy heights of plots with major damage were 3.8 to 30.6 inches shorter compared to plots with minor damage on July 6. Silking was delayed by approximately 1 to 1.5 weeks in the plots with major damage vs. plots with minor damage. Severe stalk bruising did not increase lodging; lodging was negligible across farm sites, averaging less than 2%. Kernel moisture at harvest was generally higher in plots with major damage (in three of the four fields), and yields were lower compared to the plots with minor damage.

Yields of plots with major damage ranged from 93.3 to 164.8 bu. per acre compared to yields ranging from 169.5 to 194.1 bu. per acre in plots with minor damage. One site experienced large stand losses (Seymore), which contributed to the greater yield difference between plots with major and minor injury, compared to the other three sites. Overall growing conditions following hail damage were favorable; more stressful conditions following the hail storm might have retarded the regrowth of damaged plants and increased differences in yield between plots exhibiting major and minor damage.

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Corn Variety Performance Trials for Ohio Organic Farms – 2000

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Objective

Grain crops grown organically often are raised in conditions unlike that experienced in university and commercial variety performance trials. The objective of this trial was to determine if varieties suited to high input conditions are the same as those suited to low input conditions.

Background

Table 1. Certified Organic Farms Participating in Statewide Performance Trials, Row Widths, Planting Dates, and Harvest Dates for the Corn Test Plots.

Farm No.	Region of State	County	Nearest Town	Farm	Row Width (in)	Planting Date	Harvest Date
1	Northwest	Defiance	Mark Center	Joe Hammond	30	5/9/00	11/4/00
2	North-Central	Sandusky	Clyde	Jeff Dean	22	5/20/00	11/13/00
3	North-Central	Medina	Litchfield	Gary Mennell	30	6/3/00	12/4/00
4	Northeast	Wayne	Wooster	Art Riggenbach	30	5/16/00	11/30/00
5	Central	Delaware	Delaware	Stratford Center	30	5/12/00	12/10/00
6	Central	Knox	Centerburg	Stuart Veatch	30	5/14/00	11/15/00
7	Central	Knox	Mt. Vernon	Rex Spray	30	5/16/00	11/2/00
8	West	Darke	Union City	Dan Young	30	5/14/00	11/20/00
9	West-Central	Logan	DeGraff	David Bell	30	5/17/00	11/22/00
10	South	Ross	Greenfield	Charlie Eselgroth	30	5/16/00	11/21/00

Table 2. Soil Types and Soil Test Levels for Test Plots on Participating Farms.

Farm No.	Soil Type	Ph	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)	O.M. (%)	Nitrate (ppm)
1	Nappanee silt loam	7.6	11	117	3750	753	3.3	7.1
2	Hoytville clay loam	6.4	18	108	1820	299	3.7	9.9
3	Mahoning silt loam	NA	NA	NA	NA	NA	NA	NA
4	Hoytville silt loam	7.2	56	120	1880	221	3.5	13.0
5	Blount silt loam	6.2	8	79	1670	282	3.1	17.1
6	Bennington silt loam	5.6	12	70	1130	251	2.7	12.3
7	Chili & Bogart silt loams	5.6	31	112	950	163	2.9	12.8
8	Miamian & Crosby silt loams	6.2	36	156	1760	433	3.1	26.3
9	Miamian silt loam	6.8	38	107	1600	415	3.1	13.3
10	Miamian silt loam	6.5	21	86	1690	305	3.1	14.4

NA= not available.

The corn varieties evaluated for the project included the following:

Agrigold A6447 – yellow food grade with pink cob and 109-day maturity
Baldridge 611 – a corn silage variety with yellow and white kernels and 112-day maturity
Bird ND-70 – a nutrient dense corn, yellow grain, red cob with a 111-day maturity
Cash RS (OP) – an open-pollinated variety, yellow grain, red cob with a 113-day maturity
Doebler 636XY – yellow grain with pink cob and 109-day maturity
French's 440 – yellow grain with red cob and 108-day maturity
NC+Organics 4880 – yellow grain with white cob and 110-day maturity
Pioneer 34K77 – yellow food grade with white cob and 107-day maturity
Schlessman 550 – 3-way cross, yellow grain with variable cob color and 108-day maturity
Steyer Seed 2340 – yellow grain with red cob and 106-day maturity
White Cap (OP) – an open-pollinated variety, yellow grain, white or pink cob, 85-day maturity
Yoders 510 – yellow corn, white cob with 108-day maturity.

Methods

The study was conducted as a randomized complete block design using the 10 farms as blocks or replicates. Twelve varieties were selected by producers at a planning session to prepare for the study. These varieties included food-grade and feed-grade corn. Two open-pollinated varieties were added to the selections to respond to inquiries regarding their performance in Ohio. The varieties were randomized at each farm (one replication per location) in field length strips averaging nearly 1,200 feet in length with widths varying from 10 to 60 feet (4 rows to 24 rows), but averaging 24 feet. Farmers were instructed to use planting rates they normally use with the only seeding rate recommendations being for Baldridge 611 and Cash RS. Providers of the seed for those two varieties recommended rates should be kept close to 20,000 seeds per acre.

Producers were asked to record the date for each variety when half the plants had achieved the R1 growth stage (first leaf unfolded after emerging). Soil samples were taken approximately three to four weeks after planting, corresponding to what would be the time of sampling for sidedress nitrogen recommendations in conventional fields. Early season stand and height data were the averages of five replicates per variety per farm taken at soil sampling time.

The entire plot area was harvested at Farm No. 2, 3, 6, 7, 8, and 9 to reduce operator inconvenience. Farm No. 1 harvested the west three rows of six-row strips; Farm No. 10 harvested the center four rows of six-row strips. Farms No. 4 and 5 harvested ears of corn by hand using 40-row-feet and 80-row-feet samples respectively. All other data, other than yield, grain moisture, and test weight, were taken from the center two rows of each variety strip plot.

Results

All but one of the fields sampled showed low levels of nitrate-nitrogen in the soil. These fields, had they been conventional fields, would have had nitrogen fertilizer applied to achieve optimum corn yields (e.g., Iowa recommendations would suggest additional N for nitrate levels below 21 ppm.). Farms No. 5 and 6 were below optimum P and K levels. Farm No. 1 was below optimum P and Farm No. 10 was below optimum K.

Table 3. Early Season Growth and Development.

Variety	Emergence[1] (%)	Days to Emergence[2]	Height 3-4 Weeks After Planting (in)	Growth Rate - Emergence to 25th Day[2] (in/day)
Agrigold A6447	92.5 ab	9.1 a	6.8 cde	0.36 cd
French's 440	91.6 abc	9.9 bc	8.0 a	0.44 a
Doebler 636XY	92.2 ab	9.5 ab	7.4 abc	0.41 abc
NC+ Organics 4880	94.5 ab	10.1 bcd	6.5 de	0.37 bcd
Pioneer 34K77	91.7 abc	9.5 ab	6.9 bcd	0.37 bcd
Steyer 2340	84.4 cd	9.8 abc	7.6 ab	0.42 ab
Bird ND-70	89.3 bcd	9.8 abc	7.2 bcd	0.41 abc
Yoders 510	76.2 e	11.3 e	5.4 f	0.34 d
Baldridge 611	97.7 a	10.8 de	6.6 de	0.41 abc
Schlessman 550	84.3 cd	9.8 abc	6.2 e	0.37 bcd
White Cap (OP)	83.6 de	9.6 ab	6.9 bcd	0.37 bcd
Cash RS (OP)	91.2 abcd	10.4 cd	7.2 bcd	0.42 abc
Average all varieties	**89.2**	**9.9**	**6.9**	**0.39**
LSD (0.05)	7.6	0.7	0.75	0.055
CV %	9.6	7.5	11.9	14.5

[1] Planting rates across farms averaged 23,726 seeds per acre except White Cap at 22,692 seeds per acre and Baldridge and Cash RS both at 21,742 seeds per acre.
[2] Emergence date for each variety not collected at two farms.
Means followed by the same letter are not significantly different from each other.

Table 4. Agronomic Performance of Corn at Harvest.

Variety	Yield[1] (bu/A)	Harvest Population[2] (plants/A)	% of Seeding Rate[2]	Harvest Moisture (%)	Test Weight (lbs/bu)
Agrigold A6447	124.6 a	22,511 a	93.6 a	21.9 d	54.72 c
French's 440	118.8 ab	21,372 a	88.7 ab	19.6 ab	53.99 cde
Doebler 636XY	114.9 ab	21,657 a	89.8 a	20.0 b	52.64 fg
NC+Organics 4880	114.6 ab	21,056 ab	87.5 abc	20.7 bcd	53.40 ef
Pioneer 34K77	112.3 ab	21,407 a	88.8 ab	19.9 b	56.03 a
Steyer 2340	107.6 bc	21,093 ab	87.7 abc	20.2 bc	53.59 def
Bird ND-70	95.8 cd	21,852 a	91.1 a	19.2 ab	55.95 ab
Yoders 510	86.0 d	18,817 cd	78.3 d	21.5 cd	53.25 ef
Baldridge 611	61.2 e	19,718 bc	90.3 a	21.8 d	54.69 cd
Schlessman 550	59.9 e	19,533 bcd	81.0 d	19.8 b	54.84 bc
White Cap (OP)	49.4 ef	18,746 cd	81.8 cd	18.3 a	54.76 c
Cash RS (OP)	39.9 f	18,088 d	83.0 bcd	23.4 e	51.76 g
LSD(0.05)	15.2	1,570	6.4	1.5	1.13
CV%	18.3	8.2	7.8	8.3	2.3

[1] Yields adjusted to 15.0% grain moisture.
[2] Data missing from one farm.
Means followed by the same letter are not significantly different.

Summary

Excessive rain in the northern areas of the state, particularly in the central and eastern sections, delayed planting for participating producers. Originally, plans were to have 14 certified organic farms participate in the trial; however, only 11 farms were able to plant corn successfully. The excessive moisture also hindered weed control after planting. The very wet conditions in June resulted in one less rotary hoe or cultivation pass than the producers normally plan. Not all the varieties in one planted field flowered normally, and the field was chopped for silage.

Organic grain producers regard early plant vigor as an important characteristic of varieties for their weed management programs. Normally, planting is done later than conventional farms to mechanically control early occurring weeds. Once the corn emerges, fast growth is desirable to compensate for late planting and to provide a canopy over weeds that emerge after planting. Of the varieties tested in this trial, the Agrigold hybrid was the quickest to emerge at 9.1 days after planting. This was not significantly different from the Bird, Doebler, Pioneer, Schlessman, Steyer, and White Cap varieties. Of this early emerging group, Bird, Doebler, and Steyer had the greatest growth rate. French's was significantly taller at three to four weeks after planting than any other variety with the exception of Doebler and Steyer.

Organic producers have a difficult time attaining seed that is not commercially treated. For this trial, all of the varieties were treated, except for the two open-pollinated and Yoders. (Permission was attained from the International Office of the Organic Crop Improvement Association so that the certification status of participating producers would not be jeopardized by the use of chemically treated seed.) Interestingly, Yoders had an emergence of only about 80% of the seeding rate (Table 4), which was significantly lower than all other varieties with the exception of White Cap (OP). The Yoders and Baldridge varieties were significantly slower than all other varieties in number of days to emergence after planting. The other untreated variety, Cash RS, was in the mid-range of performance in regards to emergence.

Agrigold A6447 yielded significantly better than all the other varieties with the exception of French's 440, Doebler 636XY, NC+Organics 4880, and Pioneer 34K77. One drawback to the Agrigold A6447, however, was its tendency to be among the varieties that remain high in harvest moisture. The Agrigold variety's harvest moisture was significantly greater than three of the varieties that were equivalent in yield. Grain-drying costs are a significant management factor for certified organic producers. The open pollinated varieties used in this trial performed poorly, largely due to excessive lodging, stalk breakage, and barren plants relative to the other varieties. At several farm sites, the two open-pollinated lines were already lodging severely by silk time. The open pollinated varieties consistently yielded less than half of the yields obtained by the better performing hybrids.

In general, the varieties were grown under typical organic farm conditions with moderate weed pressure and marginally low soil fertility. The results are only for one season. This trial will be repeated next year to further confirm the performance of promising varieties.

Acknowledgement

The authors would like to express their appreciation to all the participating producers for their time and efforts. Thanks are also due to the North Central Region Sustainable Agriculture Research and Education Program for providing a producer grant. We also appreciate the assistance of OSU Agricultural Technical Institute student Rhonda Rinehart for data collection during the summer. We would also like to thank the seed companies involved for providing free or discounted seed for the project. Producer Gary Mennell and Rich Pratt, OARDC plant breeder, also provided free seed of the open-pollinated lines.

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Ashtabula County Short-Season Corn Variety Test Plots

David L. Marrison, Extension Agriculture and Natural Resources Agent
Phil E. Rzewnicki, On-Farm Research Coordinator

Objective

To provide a source of objective information on the relative performance of short-season corn hybrids currently available to Ashtabula County farmers.

Background

Cooperator:	**Keith Palmer**
Nearest Town:	Andover
Major Soil Type:	Platea silt loam
Planting Date:	April 27, 2000
Harvest Date:	October 13, 2000
Study Area Yield:	149 bu/A
Study Area Moisture:	18.7%
Plot Size:	Four 30" rows by 1,150 ft.

Cooperator:	**Rick Humphries**
Nearest Town:	Orwell
Major Soil Type:	Sheffield silt loam
Planting Date:	May 1, 2000
Harvest Date:	October 23, 2000
Study Area Yield:	116 bu/A
Study Area Moisture:	18.6%
Plot Size:	Six 30" rows by 2,175 ft.

Cooperator:	**Bill Hurst**
Nearest Town:	Dorset
Major Soil Type:	Sheffield silt loam
Planting Date:	May 30, 2000
Harvest Date:	November 8, 2000
Study Area Yield:	111 bu/A
Study Area Moisture:	22.8%
Plot Size:	Twelve 30" rows by 725 ft.

Cooperator:	**Brian Forman**
Nearest Town:	Geneva
Major Soil Type:	Sheffield silt loam
Planting Date:	May 3, 2000
Harvest Date:	October 26, 2000
Study Area Yield:	155 bu/A
Study Area Moisture:	21.4%
Plot Size:	Four 36" rows by 775 ft.

Cooperator:	**Lester Marrison**
Nearest Town:	Jefferson
Major Soil Type:	Sheffield silt loam
Planting Date:	May 5, 2000
Harvest Date:	October 21, 2000
Study Area Yield:	134 bu/A
Study Area Moisture:	19.2%
Plot Size:	Four 36" rows by 500 ft.

Cooperator:	**Larry Woodard**
Nearest Town:	Cherry Valley
Major Soil Type:	Platea silt loam
Planting Date:	May 6, 2000
Harvest Date:	October 18, 2000
Study Area Yield:	180 bu/acre
Study Area Moisture:	21.6%
Plot Size:	Four 34" rows by 1,000 ft.

Methods

This research project was designed to study the performance of short-season corn hybrids using six farms within the county as replicates. Hybrids submitted for evaluation were short-season hybrids with total growing degree days (GDD) required to reach physiological maturity to be less than 2,500 GDD. The specific characteristics that were analyzed were: yield, grain moisture at harvest, test weight, and gross return per bushel after corrections were made for drying costs and low test weights.

Hybrids were randomly planted in side-by-side strip plots at each of the six farm locations. Hybrids were planted with a commercial type planter. Fertilizer, herbicides, and insecticides were applied according to recommended cultural practices for obtaining optimum grain yields. If space permitted, each host farm was permitted to put additional varieties in its plot.

Results

Table 1. Hybrid Performance Across Farm Locations[1].

Hybrid/(Maturity)	Yield[2] (bu/A)	Population (plants/A)	Test Weight (lbs/bu)	Moisture (%)	Gross Return[3] ($/A)
Pioneer 36B08 (102)	158.3 a	25,667	54.2 cd	22.2 ef	255.09
Pioneer 37M34 (99)	150.0 ab	26,250	55.3 bc	21.3 de	245.47
Novartis N45T5 (102)	147.5 ab	25,417	53.3 d	21.7 def	238.30
Croplan 345 (93)	146.8 abc	26,917	56.3 ab	20.8 cd	241.20
Pioneer 38T27 (97)	145.6 abc	25,917	55.3 bc	19.7 bc	242.56
Novartis N27M3 (91)	140.3 bc	26,750	56.8 a	18.1 a	233.79
Croplan 396 (100)	139.3 bc	26,917	51.7 e	22.7 f	218.24
Novartis N21V6 (87)	138.5 bc	26,750	56.5 ab	18.8 ab	231.26
Pioneer 38P05 (94)	138.3 bc	26,083	55.7 ab	19.3 b	231.81
Novartis 3030 Bt (95)	135.5 bc	25,917	55.3 bc	19.3 b	233.59
Croplan Max 007 (95)	132.6 cd	25,833	55.8 ab	19.8 de	220.49
Pioneer 3893 (89)	120.4 d	26,417	55.3 bc	19.9 bc	202.11
Average	141.1	26,242	55.1	20.3	231.68
LSD(0.05)	15.0	NS	1.26	1.1	

F for yield means = 2.7 and CV (yields) = 9.1%. Indicates relative performance of hybrids not affected by farm location.
Population F<1 and CV (populations) = 7.5%. Indicates the population counts on each farm were consistent across hybrids.
Test Weights F = 10.8 and CV (test weights) = 2.0%.
Moisture F = 13.1 and CV (moisture) = 4.8%.

[1] Means followed by the same letter are not significantly different at $P = 0.05$.
[2] Yields adjusted to 15.5% grain moisture.
[3] Gross Return equals: $1.75 per bushel less discounts of 2 cents per point of moisture over 15.5% and 1 (53 lb.), 3 (52 lb.) cents for test weight under 54 lbs.

Summary

All 12 corn hybrids in the trial yielded higher than the 10-year county average of 106 bushels per acre and the five-year average of 116 bushels per acre. The combined average of 141 bushels per acre was remarkable, given the cool and wet growing season for Ashtabula County, especially in the month of July.

Ashtabula County farms encounter fewer growing degree days than most of the rest of Ohio. The use of short-season hybrids potentially increases gross returns by reducing the cost of drying longer-season corns. Additionally, the shorter-season corn varieties usually can be harvested earlier in the fall when weather conditions are more favorable.

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2000 Fairfield, Licking, and Perry Counties — OSU Extension Commercial Corn Hybrid Side-by-Side Performance Trials

Jeff McCutcheon and Howard Siegrist, Extension Agriculture and Natural Resources Agents
Phil Rzewnicki, On Farm Research Coordinator

Objective

To provide a source of objective information on the relative performance of corn hybrids currently available to farmers in the three-county area.

Background

Cooperator:	**Dennis DeRolph**
Nearest Town:	Glenford
Major Soil Types:	Eculid, Killbuck & Mentor silt loams
Planting Population:	29,000/A
Plant Pop @ Harvest:	24,225/A (avg.)
Previous Crop:	Soybeans
Planting Date:	May 4, 2000
Harvest Date:	November 17, 2000
Plot Yield:	174.7 bu/A (avg.)
Grain Moisture:	16.8% (avg.)

Cooperator:	**Jim and Dave Miller**
Nearest Town:	Millersport
Major Soil Types:	Marengo & Cardington silt loams
Planting Population:	30,500/A
Plant Pop @ Harvest:	27,654/A (avg.)
Previous Crop:	Soybeans
Planting Date:	May 1, 2000
Harvest Date:	October 9, 2000
Plot Yield:	212.4 bu/A (avg.)
Grain Moisture:	19.7% (avg.)

Cooperator:	**Leigh Miller**
Nearest Town:	Lancaster
Major Soil Types:	Alexandria & Sleeth silt loams
Planting Population:	27,700/A
Plant Pop @ Harvest:	25,875/A (avg.)
Previous Crop:	Wheat
Planting Date:	May 4, 2000
Harvest Date:	October 21, 2000
Plot Yield:	201.4 bu/A (avg.)
Grain Moisture:	18.8% (avg.)

Cooperator:	**Rodney Newell**
Nearest Town:	Johnstown
Major Soil Type:	Bennington silt loam
Planting Population:	30,000/A
Plant Pop @ Harvest:	23,500/A (avg.)
Previous Crop:	Soybeans
Planting Date:	May 16, 2000
Harvest Date:	November 24, 2000
Plot Yield:	169.0 bu/A (avg.)
Grain Moisture:	19.7% (avg.)

Cooperator:	**Chris Reichley**
Nearest Town:	Somerset
Major Soil Types:	Killbuck, Cincinnati, & Alford silt loams
Planting Population:	30,300/A
Plant Pop @ Harvest:	23,482/A (avg.)
Previous Crop:	Soybeans
Planting Date:	May 15, 2000
Harvest Date:	November 6, 2000
Plot Yield:	163.7 bu/A (avg.)
Grain Moisture:	18.3% (avg.)

Cooperator:	**Slater Farms**
Nearest Town:	Hebron
Major Soil Types:	Centerburg silt loam & Pewamo silty clay loam
Planting Population:	30,000
Plant Pop @ Harvest:	23,625/A (avg.)
Previous Crop:	Soybeans
Planting Date:	May 10, 2000
Harvest Date:	November 22, 2000
Plot Yield:	178.6 bu/A (avg.)
Grain Moisture:	20.6% (avg.)

Cooperator:	**Mike Thomas**	Planting Population:	29,000/A
Nearest Town:	Thurston	Plant Pop @ Harvest:	25,212/A (avg.)
Major Soil Types:	Bennington, Cardington & Montgomery silt loams	Planting Date:	May 1, 2000
		Harvest Date:	September 28, 2000
Previous Crop:	Soybeans	Plot Yield:	190.7 bu/A (avg.)
		Plot Moisture:	25.7% (avg.)

Methods

This study was designed to compare corn hybrid performance using seven farms in a three-county area. Companies submitted hybrids for evaluation based on area market share. Eight hybrids were included in this evaluation.

Experimental design was a randomized complete block with the seven farms serving as replications. Planting order of the hybrids was randomly selected for each farm site. The eight hybrids were planted side-by-side at each location. No check/tester variety was used. Each of the farms had three replications to provide site-specific information to each farm. The hybrids were planted in six-row field-length strips. Strip length was greater than 750 feet at each site. All hybrids were planted with the individual cooperator's planter. Fertilizer, herbicides, and insecticides were applied according to the cooperator's crop-management plan and within recommended cultural practices for obtaining optimum grain yields.

Harvest was done with the cooperator's combine. Final stand count, plot area, total weight, percent moisture, and test weight measurements were taken. Yield was adjusted to 15% moisture. The longest distance between two fields used in this trial was 39 miles.

Results

Table 1. Hybrid Performance Across All Farm Locations.

Hybrid	Yield (bu/A)[1]	Final Stand (plants/A)	Test Weight (lb/bu)	Grain Moisture (%)
Pioneer 34B23	193.5 a	23,678	58.3 a	19.5 cd
Norvartis N70-D5	189.1 ab	25,940	58.1 ab	20.1 abc
Seed Consultants SC 1118	187.8 abc	25,206	58.2 a	20.2 ab
Golden Harvest H-9229	184.5 bc	25,633	58.2 a	19.9 bc
Agrigold A6490	184.3 bc	25,006	58.3 a	20.1 abc
Mycogen 2799IMI[2]	182.6 bc	23,760	56.8 c	20.6 a
Asgrow RX738RR	180.9 c	24,653	57.7 b	19.2 d
Pioneer 33K81	173.6 d	23,520	58.1 ab	19.9 bc
LSD (0.05)	7.1	NS	0.4	0.6
F	5.1	1.9	10.5	4.0
CV (%)	11.6	10.8	1.1	5.0

Means followed by the same letter are not significantly different at $P = 0.05$.
[1] Adjusted to 15.0% grain moisture.
[2] Hybrid suffered wildlife damage at one farm location resulting in appoximately 12% less yield than replicate average.

Summary

According to this trial, the top yielding varieties, which were not significantly different from each other, were Pioneer 34B23, Norvartis N70-D5, and Seed Consultants SC 1118. The results for Mycogen 2799IMI should be viewed carefully as it may have performed equally well with the highest yielding hybrids had it not been damaged by wildlife at one location. The Pioneer 33K81 yielded significantly less than all other hybrids in the trial.

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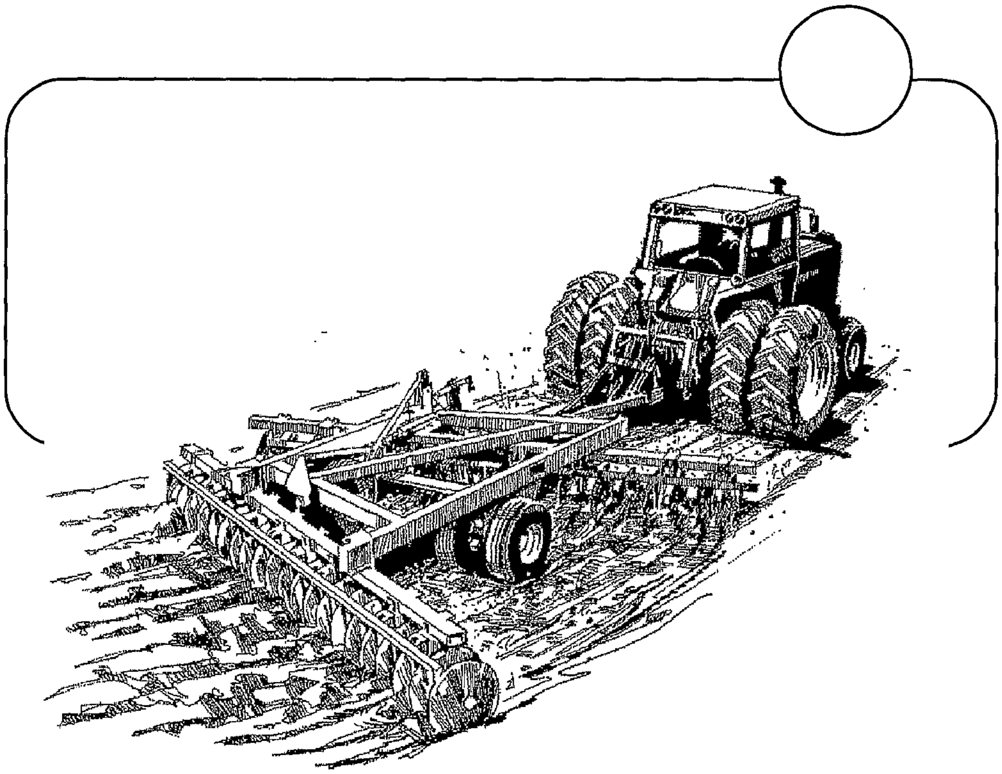
Tillage



Effect of Fall Strip Tillage on Corn Yield

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Farm Focus/Research Coordinator

Objective

To compare corn yields using fall strip tillage vs. conventional spring tillage.

Background

Cooperator:	Marsh Foundation/Farm Focus	Soil Test:	pH 6.2, P 76 ppm, K 168 ppm
County:	Van Wert	Herbicide:	PRE - Harrness Xtra (2.4 qt/A) + Roundup Ultra (1 pt./A) + AMS (2 lb./A)
Nearest Town:	Van Wert		
Soil Type:	Millgrove silt loam/Haney loam	Insecticide:	Lorsban 15G, 8 oz. per 1,000 row ft.
Drainage:	Systematic tile	Hybrid:	USA Hybrids 654
Previous Crop:	Soybeans	Row Spacing:	30-inch
Tillage:	See Methods	Planting Rate:	36,000 seeds/A
Fertilizer:	190 lbs./acre UAN broadcast on 4/26/00	Planting Date:	April 28, 2000
		Harvest Date:	October 18, 2000

Methods

Two tillage methods, fall strip tillage, and spring field cultivation were replicated three times in a randomized complete block design. The fall strip-till work was performed on November 23, 1999, by using a six-row 30-inch Trail Blazer strip-till machine. The spring cultivation was performed twice on April 28, 2000, with a cultivator set at a depth of two to three inches. Each treatment was 45-feet wide by a minimum of 520 feet in length. The study was planted using a John Deere 7000 Max Emerge six-row planter. The target seeding rate of 28,500 seeds per acre was not achieved due to a program error with the variable rate seeder.

Harvest populations were evaluated by counting the number of plants on each side of a 17.5-feet tape at three different locations in each plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. Individual plot size harvested was a minimum of 0.54 acre. Each plot was harvested, then weighed by a calibrated weigh wagon, and grain yield was adjusted to 15% moisture.

Results

Harvest population and yield means for each treatment are given in the table on the following page.

Treatment	Harvest Population (plants/A)	Yield (bu/A)
Spring Field Cultivation	32,900	173.8
Fall Strip Till	33,100	168.7
LSD ($P = 0.05$)	NS	NS
CV (< 15% is credible)	4.3%	5.2%

NS = Not Significant

Summary

As indicated in the previous table, yield and harvest population stand counts were not significantly different between the two tillage practices. Even though the conventional tillage system mean yield was 5.1 bushels per acre better than the strip till, variation within the replications caused this difference to be statistically not significant.

Actual field conditions during the strip-tillage process were wetter than preferred. As such, the strips were not completely cleared of residue after strip tilling. This condition did not affect planting conditions the following spring, and there were no observed differences in plant emergence between the treatments. There also was no significant difference in the final stand counts just prior to harvest.

This was the first study conducted at Farm Focus looking at strip tillage as an alternative to conventional tillage. The results look very promising, and additional trials are planned for next year. As always, it is best to consider multiple years and sources of information to help in making the decision to adopt a new practice such as strip tillage in your farming operation.

Acknowledgement

The authors wish to express their appreciation to the Van Wert County Soil and Water Conservation District for providing expertise and the strip-till machine used in this study.

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Strip-Tillage and No-Tillage Effect on Corn Production

Ben Schmidt, Extension Agent, Agriculture and Natural Resources

Objective

To evaluate corn response to fall strip-tillage soil preparation vs. spring no-tillage.

Background

Cooperators:	Jerry and Leon Klopfenstein	Herbicide:	Acquire (glyphosate) (1.5 pts./A) Guardsman (4.6 pts./A)
County:	Paulding		
Soil Series:	Latty Silty Clay	Hybrid:	Pioneer 37B23
Tillage:	See Methods	Row Width:	30 inches
Previous Crop:	Soybeans	Seeding Rate:	29,900 seeds/A
Soil Test:	O.M. 4%, pH 6.9, P 83.5ppm, K 187 ppm	Planting Date:	May 15, 2000
		Harvest Date:	November 19, 2000
Fertilizer:	9-18-9 starter 4.3 gal/A		

Methods

The experimental design was a randomized complete block design of field length (2,530 ft.) by eight-row-wide plots (0.87 acre) with five replications. The design for the temperature measurements was completely randomized. Fall strip-tillage was done on October 29, 1999, in a field that was no-tilled the previous five years.

The first 100 feet of the field alongside the test area was strip-tilled to provide a buffer for the first treatment plot that was strip-tillage. A buffer of no-till was used on the opposite side of the field next to the last treatment plot that was no-till. Starter fertilizer was applied at planting in a 2" by 4" placement.

Results

Table 1. Soil Temperatures Recorded 4/27/2000 at 8:45 a.m. with Air Temperature of 51ºF. (Average of 7 Measurements).

Location	Soil Temperature (ºF)
Within tilled strips	49.1 a
Between tilled strips	46.3 b
No-till	47.6 ab
LSD (0.05)	2.4
F = 3.0, CV = 4.5%	

Means followed by the same letter are not significantly different.

Table 2. Harvest Population and Yields.

Treatment		Harvest Population (plants/A)		Yield (bu/A)
Strip Till		28,227		141.0 a
No-Till		28,401		129.6 b
LSD (0.05)		NS		9.0
	F<1	CV=2.4%	F=12.2	CV=3.8%

Means followed by the same letter are not significantly different.
NS = Not Significant

Summary

There was not a large difference in soil temperature between the tilled strip and the no-till areas as some temperature experiments have shown. However, the soil temperatures within the strip-till strips were significantly warmer than temperatures outside those strips. The soil temperatures for the no-till areas were not significantly different from either strip-till area. This may have been due to the presence of an abundant night-crawler population and the lowered amounts of the previous year's soybean residue. The night crawlers had most of the residue in middens, exposing large areas of the soil surface.

The harvest plant populations were not significantly different between the tillage treatments.

On average, the strip-till yield was significantly higher than the no-till yield. The strip-till yields were consistent across all repetitions. The no-till yields, however, decreased across replications as the soil became more poorly drained. Therefore, one may conclude that strip-tillage may provide a greater yield advantage in more poorly drained soils.

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No-Till vs. Chisel for Corn/Soybean Rotations

Dennis Baker, Extension Agriculture and Natural Resources Agent

Objective

To compare tillage effects on corn and soybean yields when using no-till and disk-chisel tillage systems in a three-year trial.

Background

Site:	Darke County Farm
Nearest Town:	Greenville
Major Soil Type:	Patton silty clay loam, Crosby silt loam
Drainage:	Subsurface
Row Width:	30

2000 Corn/1999 Soybean/1998 Corn Field

2000 Soil Test Levels:	pH	6.5
	P	38 ppm
	K	175 ppm
Fertilizer:	135 lbs./A 18-46-0	
	100 lbs./A. 0-0-60	
	150 lbs./A Nitrogen as 28% applied with herbicide	

Herbicides:	Leadoff (5 pt./A), Basis (1/3 oz./A), Banvel (3 oz./A)
Insecticide:	Pounce (3 oz./A)
Seeding Rate:	29,500 seeds/A
Variety:	Pioneer 33R81
Planting Date:	May 6, 2000
Harvest Date:	Oct. 25, 2000

2000 Soybean/1999 Corn/1998 Soybean

2000 Soil Test Levels:	pH	6.1
	P	70 ppm
	K	210 ppm
Fertilizer:	100 lbs./A 0-46-0	
	125 lbs./A 0-0-60	

Seeding Rate:	186,000 seeds/A
Hybrid:	Countrymark 3865
Planting Date:	May 9, 2000
Harvest Date:	October 11, 2000

Methods

There were six replications of two treatments in each field: Chisel vs. No-till. Experiment design was a complete randomized block design. Individual treatment plots were 12 rows (30 ft.) wide by lengths ranging progressively from 760 to 1,400 feet for this year's corn. Individual treatment plots were 12 rows (30 ft.) wide by 1,465 feet in length for the soybeans. The tilled plots were prepared using a soil commander disk ripper and once over with a field cultivator with cultipacker. Both crops were planted with a Buffalo slot planter into adequate soil moisture and adequate rainfall for good germination. As the crop developed, there were no obvious differences in the plots.

Results

Treatments	Corn Yield (bu/A)	Soybean Yield (bu/A)
No-Till	112.6	46.3
Chisel	125.1	47.3
Significance $P = 0.05$	NS F = 2.1, CV = 12.7%	NS F = 1.8, CV = 2.7%

Summary and Notes

There were no significant differences in yields between the two treatments. This experiment can best be summarized using the following chart showing corn and soybean rotation plots in two parts of the same field for the past three years.

Field N2			Field N3		
1998 - Soybeans -	**no-till**	47.1 bu./A	**Corn -**	**no-till**	106.1 bu./A
	chiseled	47.7 bu./A		**chiseled**	138.2 bu./A
1999 - Corn -	**no-till**	182.2 bu./A	**Soybeans -**	**no-till**	40.2 bu./A
	chiseled	182.4 bu./A		**chiseled**	50.7 bu./A
2000 - Soybeans -	**no-till**	46.3 bu./A	**Corn -**	**no-till**	112.6 bu./A
	chiseled	47.3 bu./A		**chiseled**	125.1 bu./A

For three years, there was virtually no difference in yields when comparing no-till to chiseled in Field N2 in a corn/soybean rotation. The field had been in no-till corn and soybean rotation from 1993 through 1997. The same experiment conducted in a contiguous part of the same field (Field N3) in 1998 and 1999 significantly favored the chisel-tillage system. It appears that there has been some factor in that particular part of the field that has limited yield when planting no-till corn or soybeans. It also appears that the limiting factor(s) may not have favored the chiseled system so much in 2000. The tillage comparison will be continued one more year with soybeans in Field N3 in 2001.

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Effects of Tillage on Corn Following Soybeans or Wheat

Alan Sundermeier, Extension Agriculture and Natural Resources Agent
Matt Davis, Managers, OARDC Northwest Branch Research Farm

Objective

Evaluate the effects of tillage on corn yield following either soybeans or wheat.

Background

Site:	OARDC NW Branch	Fertilizer:	150-50-75 lbs/A actual $N\text{-}P_2O_5\text{-}K_2O$
County:	Wood		
Previous crops:	Soybeans and Wheat	Herbicides:	Bicep
Soil Type:	Hoytville clay	Planting Date:	May 20, 2000
Tillage:	See Methods	Planting Rate:	30,000 seeds/A
Variety:	Pioneer34B23	Row Width:	30 inch
		Harvest Date:	10-25-00

Methods

In the fall of 1999, experiment plots were established in soybean stubble and in wheat stubble in a randomized complete block design with three replications. Treatments consisted of the following eight tillage systems:

1. No-till only.
2. No-till and row sweeper (10 days before planting to sweep residue off row).
3. Fall strip tillage with flat seedbed.
4. Fall strip tillage with raised seedbed.
5. Fall chisel plow and fall finish tool (stale seedbed).
6. Fall chisel plow and spring finish tool.
7. Fall moldboard plow and fall finish tool (stale seedbed).
8. No-till and fall deep subsoil (paratill deep ripper with no further tillage).

Individual treatment plot size was 10 feet wide by 50 feet in length. Corn was planted after spring finish tillage was completed. Hourly soil temperature (two-inch depth in seed zone) was recorded on four tillage systems from April 20 to May 9, 2000. Average soil temperatures were calculated. Soil moisture was determined from two-inch deep soil samples collected on May 9, 2000. This date was considered acceptable planting for strip tillage, row sweeper, and stale seedbed plots. Residue percentage was determined on May 9, 2000. Final corn stand populations were taken two weeks before harvest.

Results

	After Soybean			After Wheat		
Treatment System No.	Residue (% in row)	Soil Temperature (ºF)	Soil Moisture (% water)	Residue (% in row)	Soil Temperature (ºF)	Soil Moisture (% water)
1	72.5 c	19.4	19.4	99.0 d	55.7 a	21.4
2	10.0 a	18.2	18.2	15.0 a	58.1 b	18.1
4	15.0 ab	18.6	18.6	39.0 b	57.7 ab	19.6
5	30.0 bc	19.3	19.3	50.0 c	59.2 b	19.9
LSD (0.05)	5.6	NS	NS	2.6	2.2	NS

Means within a column followed by the same letter are not significantly different.
NS = Not Significant.

	After Soybean		After Wheat	
Treatment	Final Stand Count (plants/A)	Yield (bu/A)	Final Stand Count (plants/A)	Yield (bu/A)
1	24,000 abc	128.3	20,750 a	64.9 a
2	23,250 ab	124.6	24,250 ab	81.5 abc
3	24,000 abc	131.7	23,500 ab	85.7 abcd
4	25,000 bc	129.2	23,500 ab	78.3 ab
5	25,250 bc	130.1	25,250 b	108.5 d
6	26,000 bc	122.8	24,750 b	83.3 abc
7	22,000 a	128.3	24,250 ab	103.9 cd
8	23,500 abc	130.2	23,500 ab	90.1 bcd
LSD (0.05)	2,605	NS	3,533	22.8

Means within a column followed by the same letter are not significantly different.
NS = Not Significant.

Summary

Soybean residue, although well scattered, was a thin layer since 1999 was the first year of no-till which may have allowed tillage systems to have no effect on yield even though there was a significant difference in the amount of soybean residue among the four treatments. The results of the soybean portion of the study indicate that no-till will produce the highest net return after soybeans due to fewer trips across the field and reduced labor.

The large amount of wheat residue resulted in cooler soil temperatures in no-till. The no-till soil was also wetter at planting time although not significantly. These soil conditions in no-till are believed to have resulted in lower plant population and subsequently lower yield. The wheat portion of this study confirms that higher corn yields may be achieved when wheat residue is incorporated into soil. No-till corn is not recommended in Hoytville clay soils following wheat based upon this study. Excess rainfall during most of the season may have affected the treatments this season.

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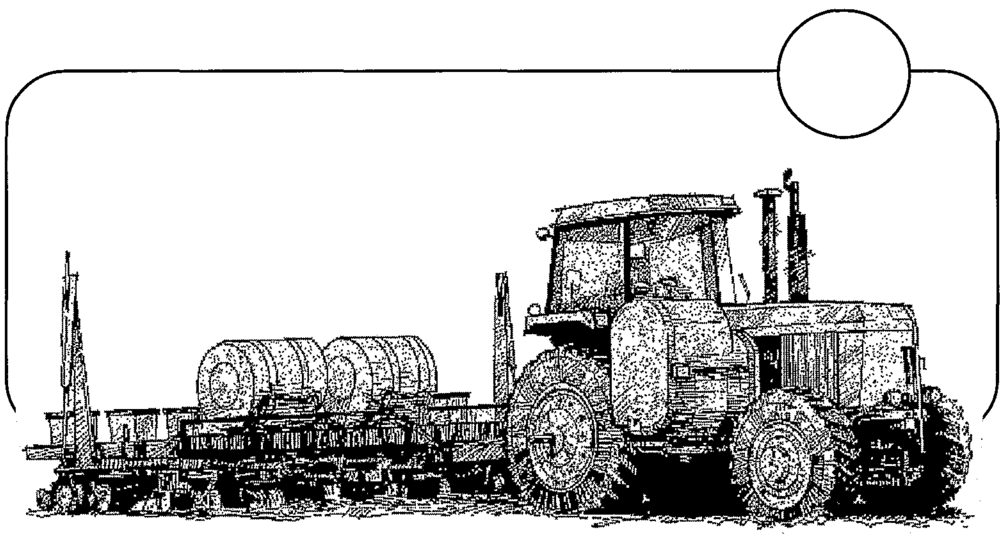
Soil Fertility and Fertilizers



Foliar Fertilizer Applications for Soybean Production

Greg La Barge, Extension Agent, Agriculture and Natural Resources

Objective

To determine the effects of foliar fertilizer sources, application frequency, and rates on soybean yield.

Background

Cooperator:	Nate Andre	Fertilizer Rate:	See Treatments
County:	Fulton	Hybrid/variety:	Garst 295
Soil Type:	Mermill loam	Planting Date:	April 25, 2000
Tillage:	No-till	Seeding Rate:	200,000 seeds/A
Previous Crop:	Corn	Harvest Pop:	180,000 plants/A
Soil Test:	pH=7.1, P= 33 ppm, K= 77 ppm, Mn= 7 ppm, OM=5.3%, CEC=12.4	Harvest Date:	October 11, 2000

Methods

The plot design was a randomized complete block with six replications. Plots were 15 ft. x 50 ft. with a harvest area of 7.5 ft. x 35 ft. The site in north central Fulton County was selected due to a history of Mn deficiency in soybeans. Soil testing showed medium to high for all values tested except for manganese that was in the low range. Foliar manganese was applied on 6/28/00 at R1 (early flower). For treatments with two applications, the second application occurred on 7/12/00 at R2 (late flower). All products were applied in 30 gallons of water per acre.

Table 1. Complete Product Listing for Study.

Product Name	Company	Formulation	Use Rate per Acre	Lbs./A Nutient Applied	Cost/A
ElamMax Mn (EM)	Phosyn	27% Mn	0.5 pt	0.13 Mn	$2.46
Folizyme (Fol)	Stoller	12%N, 3%K, 3% Ca, 3% Mg	2 qt	0.63 N, 0.15 K, 0.15 Ca, 0.15 Mg	$1.62
Keylate (Key)	Stoller	5% Mn	2 pt	0.06 Mn	$2.86
White Label Mn (WL)	Stoller	6% Mn	2 pt	0.07 Mn	$1.80
Harvest More Urea Mate (HMUM)	Stoller	5% N, 10% P, 27%K, 4% Ca, 1.5% Mg, 0.15% B, 0.008% Co, 0.3% Cu, 0.5% Mn, 0.008% Mo, 0.5% Zn	5 lbs	0.25 N, 0.5 P, 1.35 K, 0.2 Ca, 0.075 Mg, 0.0004 Co, 0.015 Cu, 0.025 Mn, 0.0004 Mo, 0.025 Zn	$4.30

Results

Table 2. Soybean Yield Response to Foliar Fertilizer Applications and Timing.

Treatment	Application Date & Growth Stage	Total Actual Mn (lb/A)	Yield * Bu/A
EM	6/28 (R1)	0.13	38.6 a
Fol + WL + Key	6/28 (R1)	0.19	38.0 a
EM	6/28 (R1) + 7/12 (R2)	0.26	37.5 a
WL	6/28 (R1) + 7/12 (R2)	0.14	36.0 a
WL	6/28 (R1)	0.07	35.4 ab
EM + HMUM	6/28 (R1)	0.17	34.8 ab
Check		0.0	27.4 b

* Yields followed by the same letter are not significantly different from each other.
LSD (0.05) = 8.4 bu/A
CV = 20.1%

Discussion

Due to a calculation error, the ElamMax Mn+ Harvest More Urea Mate treatment resulted in a 1.6 times over-application of the Urea Mate. Eight pounds per acre were applied instead of the intended five pounds per acre. This did result in foliar burning of the upper leaves which may have decreased yields. There is some margin of safety in these products, since the over-application did not result in a significant yield loss, but growers should be cautious in applications of foliar fertilizer to limit foliar damage.

Observations of foliar color did not vary greatly among any of the treatments. Yellowing from manganese deficiency was more apparent due to difference in plot location than treatment applied.

Manganese is commonly low in availability on higher organic matter soils with pH greater than 7. Yield was significantly greater than the no Mn check in four of the six treatments. There was no significant difference between any two of the foliar fertilizer products.

Area farmers using the ElamMax Mn product experience plugged nozzles when the mix sits overnight in a boom sprayer. For the plot trial, this was not a problem. The manufacturing company is aware of and working on the problem.

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Supplemental Nitrogen on Soybeans

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Ed Lentz, Extension Northwest District Agronomist
Gary Prill, Farm Focus / Research Coordinator

Objective

Evaluate the yield response of soybeans to supplemental nitrogen applied at the R4 (full pod) stage.

Background

Cooperator:	Vantage Career Center / Farm Focus	Herbicide:	PRE - Roundup Ultra (1.5 pt. / A) + AMS (3.4 lb. / A)
County:	Van Wert		POST - Roundup Ultra
Nearest Town:	Van Wert		(1.5 qt. / A) + AMS (3.4 lb. / A)
Soil Type:	Hoytville	Variety:	Wellman W3127RR (treated)
Drainage:	Tile	Planting Rate:	200,000 seeds / A
Previous Crop:	Corn	Row Width:	7.5 inch
Tillage:	No-till drilled	Planting Date:	May 17, 2000
Soil Test:	pH 5.4, P 41 ppm, K 156 ppm	Harvest Date:	October 2, 2000

Methods

The experimental design was a randomized complete block with four replications of three treatments. Treatments included: (1) 83 lb. per acre actual nitrogen from urea plus Agrotain® (5 qt. per ton of urea), (2) one pass of application equipment without fertilizer, and (3) no fertilizer or equipment traffic. Nitrogen was applied during the R4 growth stage (full pod development prior to seed formation) on August 4, 2000, using a broadcast spreader on a tractor in a 15-foot swath. One pass was made for each treatment to produce a 15-foot-wide by 712-feet-long treatment area, with a 10-foot-wide border between treatments. All plots were planted using a John Deere 750 no-till drill.

Harvest populations were evaluated by counting the number of plants on each side of a tape for a distance of 17.5 feet at three different locations in the treatment plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. The center 14.5 feet of each plot were harvested and then weighed by a calibrated weigh wagon, and grain yield was determined at 13% moisture.

Results

Yield and harvest population means for each treatment are given in the table on the following page.

Treatment	Harvest Population — plants/A —	Yield — bushels/A —
Nitrogen	123,200	56.2 a
Equipment traffic	128,100	58.9 a
No traffic	119,000	65.2 b
LSD (P =0.05)	NS	5.0
CV (< 15%=credible)	10.9%	3.7%

Results with the same letter are not significantly different at P = 0.05.
NS = not significant.

Summary

Supplemental nitrogen applied to soybeans during the R4 stage did not increase yields. This study complements work done at Farm Focus in 1999, whereby nitrogen applied to soybeans at the R2 reproductive stage did not increase yields. Urea requires at least 0.5 inch of rainfall for incorporation, otherwise nitrogen may be lost from volatilization. Agrotain® can delay these losses 10–14 days after application. In 2000, total rainfall accumulation after 14 days was 1.37 inches, with 0.98 inches of rainfall occurring within two days of the application. Thus, it is safe to assume there was adequate incorporation of the urea.

In this study, the results showed a significant decrease in yield for the two treatments that received equipment traffic during the R4 reproductive stage. This can be expected when a plant is run over during a critical stage of growth. Fertilizer equipment used in this study left two tire tracks in the 14.5-foot-wide strip that was harvested from each plot. This indicates that when an application is made to soybeans during this late stage, it probably should be done by aircraft, or the producer should be willing to accept yield loss.

Acknowledgment

The authors wish to express their appreciation to Royster Clark for donating material used in this study.

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Starter Fertilizer Comparison for Corn

Dennis Baker, Extension Agriculture and Natural Resources Agent

Objective

To compare corn yields using four different starter fertilizers including 6-24-24, urea-based 20-20-20, urea / AS 20-10-10, and Polyon®AG PCU 20-10-10.

Background

Test Site:	Darke County Farm	Soil Test:	pH 7.5, P 24 ppm, K 160 ppm
County:	Darke	Fertilizer:	Starter fertilizers; see Methods 150 lb / A N as 28% applied with herbicide
Nearest Town:	Greenville		
Soil Types:	Miami silt loam Eldean silt loam		
Drainage:	Subsurface	Variety:	Pioneer 33Y18
Tillage:	Spring chiseled	Seeding Rate:	28,500 seeds / A
Previous Crop:	Wheat	Planting Date:	April 29, 2000
Row Width:	30 in.	Harvest Date:	October 25, 2000

Methods

Polyon®AG PCU is a polymer-coated fertilizer technology that has been used on golf courses, nurseries, and home lawns. The purpose of this experiment is to field test this slow-release nitrogen form to determine its potential agronomic and / or economic advantage. The field where these plots were planted has been in no-till most years.

There were four replications of four starter-fertilizer treatments in this test. Plots were planted and analyzed in a randomized complete block design. Individual plot sizes were 12 rows (30 ft.) wide and 960 feet long. The field was spring chiseled, then prepared for planting using a field cultivator with a cultipacker. Corn was planted with a Buffalo slot planter into adequate soil moisture and with adequate rainfall to germinate the seeds uniformly. All starter fertilizer materials being tested were applied as a starter fertilizer through the fertilizer box at approximately 180 pounds per acre.

Results

Treatments	Yield (bu/A)
Polyon® coated urea-based 20-10-10	156.2
Ammonium Sulfate + urea-based 20-10-10	156.7
Urea-based 20-10-10	157.2
6-24-24 fertilizer	154.3
Significance $P = 0.05$. F <1, CV = 7.7%	NS

Summary

There were no significant differences in the yields among the four treatments. There was significant lodging in the plots; however, any influence from lodging effect on yields was likely distributed similarly across all treatments. This experiment was conducted in cooperation with Land O'Lakes Agricultural Services, which was conducting research for Pursell Technologies, Inc.

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Adding Sulfur and Zinc to Starter Fertilizer for Corn

Steve D. Ruhl, Agriculture and Natural Resources Extension Agent

Objective

To evaluate the effect of adding sulfur and zinc to row starter fertilizer on yields of corn.

Background

Cooperator:	Tom Weiler	Fertilizer:	206-70-99 lb./A actual N, P_2O_5, K_2O
County:	Morrow		
Nearest town:	Chesterville	Planting Date:	May 1, 2000
Drainage:	Naturally well-drained	Planting Rate:	30,100 seeds/A
Soil Type:	Sloan silty clay loam	Harvest Date:	October 23, 2000
Tillage:	Conventional till	Herbicides:	PRE - Atrazine (1.5 lb./A), Balance (1.0 oz./A)
Previous Crop:	Soybeans		POST – Clarity (1pt./A)
Variety:	Golden Harvest 2495		
Soil test:	pH 7.0, P 23 ppm K 154 ppm	Row width:	30 inch

Methods

This study is a split-planter design comparing starter fertilizer with starter fertilizer plus 4.1 lbs. per acre of sulfur and 0.22 lbs. per acre of zinc. The treatments were replicated four times. The size of each treatment plot was 3/10 of one acre (12 rows times 435 feet in length). The starter fertilizer used in the study was 20 gallons per acre (N 9.5 lbs., P_2O_5 22.5 lbs., and K_2O 4.1 lbs.). The entire treatment area was harvested and weighed using a weigh wagon.

Results

Treatments	Yield (bu/A)
Starter Fertilizer	197.5
Starter Fertilizer plus S and Z	195.2
F = 1.7 CV = 1.3%	NS

Summary

Some companies are advocating the use of zinc and sulfur to increase yields of corn. This increases the cost of production and further limits the profit per acre. University studies previously conducted only support the use of zinc and sulfur under special soil conditions (low organic matter, soils high in pH and available phosphorus, mucks, or some peats). Plant analysis and field tests are ways to tell if the corn is responsive to these micronutrients. In this one-year, one-site study, the addition of zinc and sulfur to the starter fertilizer did not increase yields.

Acknowledgment

The author would like to thank Golden Harvest for the donation of seed used in this study. Also, thanks to Royster Clark for the sulfur and zinc used.

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Placement of P and K on Corn

Jeff McCutcheon, Extension, Agriculture / Natural Resources, Agent
Phil Rzewnicki, On-Farm Research Coordinator

Objective

To compare corn yields under three different fertilizer programs.

Background

Cooperator:	Keith Dennis	Soil Test:	pH 6.5, P 23 ppm, K 114 ppm, CEC 9 meq / 100g
County:	Perry	Variety:	Seed Consultants 1118
Nearest Town:	Rushville	Row Width:	36 inches
Major Soil Types:	Centerburg & Luray silt loams	Planting Rate:	27,000 / A
Drainage:	Tiled	Planting Date:	May 11, 2000
Tillage:	Minimum Till	Harvest Date:	November 28, 2000
Previous Crop:	Corn		

Methods

A study was designed to compare corn yield under three different phosphorus and potassium fertilizer programs. Plots were field length (>750 ft.) and 54 ft. wide, replicated six times and completely randomized. Application of 190 lbs. per acre actual nitrogen was applied as anhydrous to all three plots. One fertilizer program was 18-46-60 actual applied by broadcasting before tillage. The second fertilizer program was 18-46-60 actual applied with the anhydrous and placed about eight inches in the soil profile. The applicator was a DMI Ecoltill 2500 with shark-fin points fed by a Harmon's 3100 air system. The third program was 9-23-30 actual applied with the anhydrous and placed at the same depth as the second program. All fertilizer applications, including anhydrous, were made on April 27 or 14 days before planting.

All plots received a surface tillage pass with an Aerway unit. The shallow tillage probably incorporated the broadcasted fertilizer to a depth of two to three inches. This is the third year for this trial using the same treatment areas as the previous years.

Results

Treatment	Average Yield Bu/A[1]	Treatment Cost/A[2]
Broadcast Full Rate	161.98	$19.04
Full Rate Deep Placement	166.12	$24.40
Half Rate Deep Placement	160.18	$16.15
F<1	NS[3]	

[1] 15% moisture.
[2] Includes actual fertilizer cost, plus estimated machinery and fuel cost based on "Ohio Farm Machinery Economic Cost Estimates for 2000."
[3] NS = Not Significant at $P = 0.05$, CV = 4.6%.

Summary

Finding no significant differences between the three treatments was not surprising since the soil-test values are above the critical level for both phosphorus and potassium. Past research indicates that if soil-test values are above the critical level, then specific placement of the fertilizer will have no significant effect on yield. This trial should also be done on a field that has soil-test values below the critical level. In that case, past research indicates that fertilizer placement will have a greater effect on yield.

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Two-Year Comparison of Fertility Systems: Commercial Fertilizer and Poultry Litter

Chris Bruynis, Extension Agriculture and Natural Resources Agent

Objective

With the construction of large poultry facilities in the area, local farmers now have approximately 500,000 tons of poultry litter available annually. This research was designed to compare the cooperating farmers' normal fertility program using commercial fertilizer to a fertility program using poultry litter plus commercial fertilizer.

Background

Cooperator:	Tim Wood	Fertilizer:	See Methods
County of Site:	Wyandot	Herbicide:	Frontier 28 oz/A
Nearest Town:	Marseilles		Canopy 6.4 oz/A
Major Soil Type:	Blount		Touchdown 1.6 pts/A
Drainage:	Surface- No Tile	Plant Population:	180,000 plants/A
Tillage:	Minimum-Till	Planting Date:	May 2, 2000
Previous Crop:	Soybeans-1998	Row Width:	9 inches
Variety:	Madison GL2930	Harvest Date:	September 30, 2000
Soil Test:	pH 7.2, P 61 lbs/A, K 157 lbs/A, O.M. 2.6%		

Methods

The plot was designed to compare the long-term returns of two different fertility systems. There were six replications of two treatments in side-by-side paired non-randomized strip plots. Individual plots were 25-feet wide and 1,200 feet in length. The study was conducted over two years with a corn/soybean rotation. The poultry litter, based on several analyses, contains ~100 lbs P_2O_5, ~70 lbs K_2O, and ~40 lbs nitrogen per ton. A single four-ton-per-acre application rate should supply sufficient nutrients for three or more crops. Commercial fertilizer application decisions were based on Extension Bulletin E-2567, *Tri-State Fertilizer Recommendations for Corn, Soybeans, Wheat, and Alfalfa,* for the two years of the study.

Table 1. Nutrient Applications and Times of Application

Poultry Litter plus Commercial Fertilizer			Commercial Fertilizer		
Application	Amount per Acre	Date	Application	Amount per Acre	Date
Poultry Litter	4 tons	March 1999	0-0-60	250 lbs	March 1999
			18-46-0	150 lbs	March 1999
			28-0-0	300 lbs	April 1999
6-19-6 starter	120 lbs	April 1999	6-19-6 starter	120 lbs	April 1999
28-0-0 sidedress	320 lbs	June 1999	28-0-0 sidedress	320 lbs	June 1999

Results

Table 2. Yields and Results for 1999 and 2000

Crop/Year	Treatment	Yield (bu/A)
Corn/1999	Commercial Fertilizer	141.6
	Poultry Litter & Commercial	143.6
		F <1, NS
Soybean/2000	Commercial Fertilizer	43.1
	Poultry Litter & Commercial	41.5
		F = 1.9, NS

NS = means not significantly different at $P = 0.05$.

Summary

After harvesting two crops, no significant yield differences were observed. The economic differences between the two systems should be examined. The poultry litter cost $15 per ton plus application charges for a total of $60 per acre. The additional fertilizer in the commercial fertilizer treatment cost $57 per acre; that, along with the application charge, totalled $61.50

per acre. No additional cost was assessed for the extra nitrogen application because under normal circumstances this would have been applied with the herbicide.

The costs of nutrient inputs were basically the same for the two different fertility systems. Two years of crop harvests indicate the yields were statistically the same, thus providing no difference in income. Soil samples taken from the plots indicate that the poultry-litter plots tend to be higher in phosphorous and pH than the commercial-fertilizer plots after two crops. These were not statistically analyzed and require further investigation to be conclusive results. This research does support the utilization of poultry litter to replace a portion of commercial fertilizer in crop production. The decision to use one fertility system over another should depend upon availability of poultry litter, cost of nutrient alternatives, and acceptance of animal nutrients by the surrounding neighborhood.

Acknowledgments

The poultry litter used in this research was partially donated by Organigro, Inc., Jack Lill, Sales Representative, 740-386-1807. Farmers Commission Company, Bill Thornton, agronomist, 419-294-1974, provided soil testing, commercial fertilizer application, and technical support. Farmers Commission Company also provided the weigh wagon.

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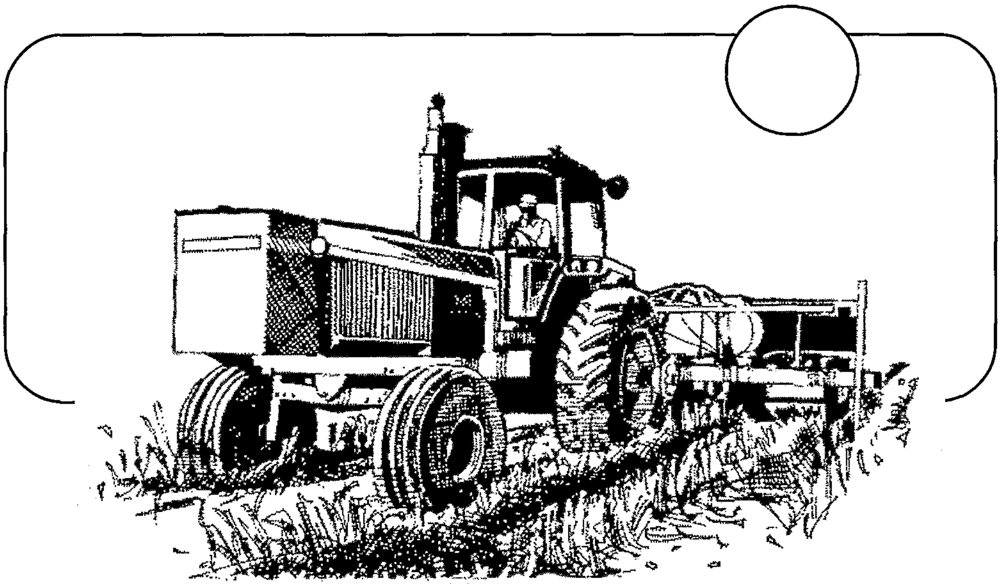
Cropping Systems



Evaluation of USDA Soybean Inoculate in a Modified Relay Intercropping System

Steve Prochaska, Extension Agriculture and Natural Resources Agent

Objective

To evaluate the effect of a new inoculate on soybean yield in a modified relay intercropping system.

Background

Modified Relay Intercropping is a system in which soybeans are planted into standing wheat around the time period of wheat pollination. Previous plot work over the last six years has resulted in soybean yields of 30 bushels per acre and wheat of 73 bushels per acre. (Yield averages over all treatments.)

Cooperator:	Dave Brewer
County:	Crawford
Soil Type:	Blount silt loam
Tillage:	No-till
Previous Crop:	Soybeans
Soybean Herbicides:	POST Select (5 oz./A) Firstrate (0.3 oz./A)
Wheat Herbicide:	2,4-D (1.5 pt./A)
Wheat Row Width:	10 inch
Soybean Row Width:	10 inch
Fertilizer:	21-75-75 actual lb./A of NPK fall applied 85 lb./A actual N as 28% spring applied
Varieties:	Wheat – Hopewell Soybean – Pioneer 9306
Seeding Rates:	Wheat – 120 lb./A Soybean – 90 lb./A
Wheat Planting Date:	October 1, 1999
Harvest Date:	July 5, 2000
Wheat Yield:	73 bu/A
Soybean Planting Date:	12, 2000
Soybean Harvest Date:	Oct. 14, 2000

Methods

New soybean inoculants have been reported to give a positive yield response in conventional tillage soybeans. As such, USDA inoculate at the labeled rate was mixed well into soybean seed, and soybeans were immediately interseeded into wheat on 6/12/2000. Soils were moist at the time of planting.

A completely randomized design was used with four replications of two treatments — USDA inoculate and untreated soybeans. Plot size per treatment was 0.138 acres. A 15-foot Great Plains 1500 drill was used to plant both the wheat and the soybeans in 10-inch rows. A 20-inch tramline was established in the wheat to facilitate soybean planting into wheat.

Results

Treatments	Yield (bu/A)
Control	37.2
USDA Inoculate	37.1
Significance ($P = 0.05$) F <1, CV = 4.5%	NS

Summary

There were no significant yield differences between the soybeans inoculated with USDA inoculate and soybeans without inoculate in the modified relay intercropping system.

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Effect of Row Width on Wheat Yield in a Modified Relay Intercropping System

Steve Prochaska, Extension Agriculture and Natural Resources Agent

Objective

To evaluate the effect of row width and modified relay intercropping on wheat yield.

Background

Modified Relay Intercropping is a system in which soybeans are planted into standing wheat around the time period of wheat pollination. Previous plot work over the last six years has resulted in soybean yields of 30 bushels per acre and wheat of 73 bushels per acre. (Yield averages over all treatments.)

Test Site:	Ohio State University Unger Farm	Fertilizer:	32-81-120 lbs. actual NPK/A applied 9/24/99 Topdressed 33 gal. 28% (99 lb N)/A on 3/24/00
County:	Crawford	Seeding Rates:	Wheat – 120 lb./A Soybean – 211,000 seeds/A
Soil Types:	Pewamo silty clay loam Blount silt loam	Planting Date:	October 7, 1999
Tillage:	Chisel plow and field cultivator	Harvest Date:	July 5, 2000
Previous Crop:	Soybeans		
Row Spacings:	7.5 inches and 15 inches		
Varieties:	Wheat - I9824 Soybean – Pioneer 93B35		

Methods

A completely randomized design (seven replications) in small plots (5 x 50 feet) was used. Treatments were 15-inch row-spaced soybeans intercropped into wheat in 15-inch rows alongside 7.5- and 15-inch row wheat with no soybeans. Wheat and soybeans were planted with a three-point hitch-mounted tool-bar planter equipped with Sunflower openers. Soybeans were interseeded on June 2. Wheat harvest was done on July 5 with a small plot combine.

Results

Treatments	Yield (bu/A)
7.5-inch row wheat	72.3 b
15-inch row wheat	70.8 b
15-inch row wheat interseeded	62.0 a

LSD (0.05) = 3.4 bu/A
F value 24.6, CV 4.0%
Means followed by the same letter are not statistically different.

Summary

Wheat yields at the two different row widths without modified relay intercropped soybeans were not significantly different from each other. However, wheat modified relay intercropped with soybeans yielded significantly less at a comparable wheat row width. This yield difference of about 12% is consistent with work done by other researchers (McCoy, S.M, T. J. Vyn, and T. D. West, *Effect of Acrylic Polymer Seed Coating on the Feasibility of Relay Intercropping in Indiana,* Purdue University) working with wide-row wheat in an intercrop system.

The difference in wheat yield may not be as large in narrower rows. Also, weather, as it affects wheat disease development and soil moisture, may impact wheat yield in a modified relay intercropping system.

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Strip Tillage and Fall-Applied Fertilizer Effects on Corn

Alan Sundermeier, Extension Agriculture and Natural Resources Agent
Ed Lentz, Extension Northwest District Agronomist

Objective

To evaluate corn response to strip-tillage vs. conventional-tillage systems and to fall-applied nitrogen within these systems.

Background

Cooperator:	Carlton Meyer	Seeding rate:	32,000 seeds / A
County:	Henry	Soil test:	OM=1.9% , P 118ppm, K 77 ppm, CEC 5.7 meq / 100g
Soil type:	Millgrove loam		
Tillage:	See Methods	Fertilizer:	See Methods
Previous crop:	Soybean	Herbicides:	Dual
Variety:	Pioneer 34E79	Harvest Date:	November 6, 2000
Planting date:	May 1, 2000		

Methods

The experimental design was a randomized complete block of field length and 12-rows wide (0.8 acres) in four replications. Three treatments were established as follows: 1) Fall strip-tillage and fertilizer with sidedress N applied; 2) fall strip-tillage and fertilizer with no sidedress N applied; and 3) conventional tillage and fall fertilizer. Fall strip-tillage and conventional tillage were done on October 21, 1999.

Conventional tillage consisted of chiseling and field cultivating and then strip till. Anhydrous ammonia plus dry fertilizer sources of phosphate and potash were applied in the fall for a total actual nutrient application of 200 lbs. N, 48 lbs. P_2O_5, and 85 lbs. K_2O per acre. Anhydrous was used in the spring for the sidedress treatment at a rate of 40 lbs. actual N per acre.

At the V2 corn stage (7-inch height), 12-inch-deep soil-nitrate samples were taken before sidedress nitrogen application. At corn silking stage, ear leaf tissue samples were taken. At corn maturity (black layer), corn-stalk nitrate samples were taken. Also, at this time ear and stalk population counts were taken.

Results:

The soil nitrate level averaged 12.5 ppm across treatments at the V2 corn stage.

The data shown on the following page are the average of the four replications.

Treatments	Ear Leaf Tissue %N	%P	%K	Stalk Nitrate ppm	Stalk Population stalks/A	Yield bu/A
Fall Conventional	3.13	0.34 a	2.07	350 a	28,500 a	149.0 a
Fall Strip Till	3.42	0.35 ab	2.25	925 a	30,750 ab	154.3 ab
Fall Strip Till plus Spring Sidedress	3.60	0.38 b	2.32	2275 b	32,750 b	160.3 b
LSD (0.05)	NS	0.04	NS	1522	3,771	7.8

Means followed by the same letter are not significantly different.
NS = Not Significant

Summary

Strip tillage compared to conventional tillage with identical fertilizer application had similar corn yields. Corn yields were not significantly different comparing fall-applied anhydrous ammonia nitrogen to the same system with an extra 40 lb. per acre of actual N sidedress. Although the fall strip till plus spring sidedress yielded significantly more than the fall conventional, the extra fertilizer cost would have made it breakeven.

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Strip Tillage and Fertilizer Timing Effects on Corn

Alan Sundermeier, Extension Agriculture and Natural Resources Agent
Ed Lentz, Extension Northwest District Agronomist

Objective

To evaluate corn response to strip tillage vs. no-till systems as well as fertilizer timing and placement.

Background

Cooperator:	Ron & Todd Hesterman
County:	Henry
Nearest Town:	Napoleon

Field I

Soil Types:	Millgrove loam
Soil Test:	pH 6.2, P 24 ppm, K 95 ppm, O.M. 2.3%, CEC 8.5 meq/100g
Tillage:	See Methods
Previous Crop:	Soybeans
Fertilizer:	See Methods
Variety:	Pioneer33G28
Seeding Rate:	30,100/A
Planting Date:	Apr 27, 2000
Harvest Date:	Oct 20, 2000

Field II

Soil Type:	Hoytville clay loam
Soil Test:	pH 5.6, P 23 ppm, K 143 ppm, O.M. 3.7%, CEC 15.9 meq/100g
Tillage:	See Methods
Previous Crop:	Soybeans
Fertilizer:	See Methods
Variety:	Pioneer33G28
Seeding Rate:	30,600/A
Planting Date:	May 6, 2000
Harvest Date:	Nov 3, 2000

Field III

Soil Type:	Hoytville clay loam
Soil Test:	pH 5.6, P 24 ppm, K 165 ppm, O.M. 3.4%, CEC 14.6 meq/100g
Tillage:	See Methods
Previous Crop:	Soybeans
Fertilizer:	See methods
Variety:	Pioneer34B23
Seeding Rate:	30,600/A
Planting Date:	May 6, 2000
Harvest Date:	Nov 3, 2000

Methods

The study was conducted on three fields within five miles of each other. Experimental design for each field was a randomized complete block using three replications of tillage x fertilizer program treatments. Each treatment plot was 12 rows (30-inch rows) by field length providing approximately 0.8 acres of area. The treatment combinations were as shown on the following page.

Treatment	Tillage	Fall Fertilizer Actual N-P-K	Planting Time Fertilizer Actual N-P-K	Fertilizer Placement	Sidedress Actual N	Total N-P-K lbs./A
1	Strip	13-63-45	85-0-0	5″ deep in strip	96	193-63-45
2	Strip	14-68-50	85-0-0	5″ deep in strip	96	195-68-50
3	Strip	199-68-50	None	5″ deep in strip	None	199-68-50
4	Strip	None	90-12-2	2″ x 2″	96	186-12-2
5	No-till	None	90-12-2	2″ x 2″	96	186-12-2

Treatments 1, 4, and 5 were applied to Field I. Treatments 2, 3, 4, and 5 were applied to Fields II and III. All strip tillage was conducted in the fall of 1999. Fall nitrogen in Treatment 3 consisted of anhyhrous ammonia combined with N-serve in addition to dry 14-68-50 fertilizer. Planting time fertilizer consisted of 28% N in treatments 1, 2, 4, and 5 combined with 5-12-2 liquid starter for treatments 4 and 5. Sidedress fertilizer consisted of 28%N.

On May 8 emergence stand counts were taken in Field I. In all three fields at the V2 or two-leaf stage of corn (appox. 7″ height), one-foot deep soil samples were taken to monitor nitrate levels. Field I averaged 19.7 ppm nitrate. Replicates of the nitrate levels in Fields II and III were taken for statistical analysis. At corn silking stage, ear leaf samples were taken in all three fields. At corn maturity or black layer, corn stalk nitrate samples were taken. Also at this time, ear and stalk population counts were recorded.

In Field I and Field III, continuous recording thermometers were placed in the no-till areas and in fall strip-till zones. Soil temperature was recorded at the 2″ seed zone, and average temperature was calculated for two time periods in Field I and one period in Field III.

Results

Average 2″ soil temperatures (F°) recorded were:

	No-Till	Strip Till
Field I — April 8 to 26	47.6	62.0
Field III — April 8 to 26	54.1	55.4
Field I — May 2 to 24	48.0	63.3

The following table shows the averages of three replications. Means followed by the same letter within a field are not significantly different at $P = 0.05$.

Field I	Emerged Plants	Soil NO_3	Ear Leaf Tissue			Stalk NO_3	Stalk Population	Yield
Treatment	(plants/A)	(ppm)	%N	%P	%K	(ppm)	(ppm)	(bu/A)
1	31,333 b	-	3.42	0.27	1.96	1966	30,000	179.5
4	31,333 b	-	3.25	0.25	1.92	2400	28,830	181.7
5	21,000 a	-	3.49	0.26	1.88	966	30,500	177.0
LSD (0.05)	10,040	-	NS	NS	NS	1408	NS	NS
Field II								
2	-	20.0 b	2.74	0.25	2.21 b	233	28,670	165.7 c
3	-	18.7 b	2.85	0.25	2.23 b	100	29,330	162.1 bc
4	-	15.3 a	2.86	0.26	2.07 a	400	27,830	153.8 ab
5	-	19.7 b	2.88	0.25	2.05 a	433	29,500	152.6 a
LSD (0.05)	-	2.9	NS	NS	0.06	NS	NS	8.4
Field III								
2	-	33.7 b	3.17	0.27 c	2.35	2500 b	28,333	148.0 b
3	-	14.7 a	2.83	0.23 a	2.32	167 a	28,333	145.9 a
4	-	17.0 a	2.99	0.25 b	2.09	100 a	28,500	139.8 ab
5	-	19.0 ab	2.90	0.24 ab	2.08	200 a	29,500	139.7 a
LSD (0.05)	-	14.7	NS	0.02	NS	1036	NS	5.9

Summary

Within all three fields, strip tillage compared to no-till with identical fertilizer application had similar corn yields.

In Field I, strip tillage resulted in significantly quicker corn emergence 10 days after planting. Fertilizer timing and placement did not affect yield between the strip-tillage treatments.

In Field II, fall-applied dry P and K with a higher total pounds per acre of N-P-K yielded significantly better than liquid starter at planting. This did not happen in Field III, however.

In both clay loam fields, corn yields were not significantly different comparing fall-applied anhydrous ammonia nitrogen to spring-applied 28% nitrogen having the same total pounds per acre of actual N-P-K using strip tillage.

One may conclude for both clay loam fields, fall applied N-P-K in strip tillage resulted in yields equal to or better than the other cropping systems used in this study.

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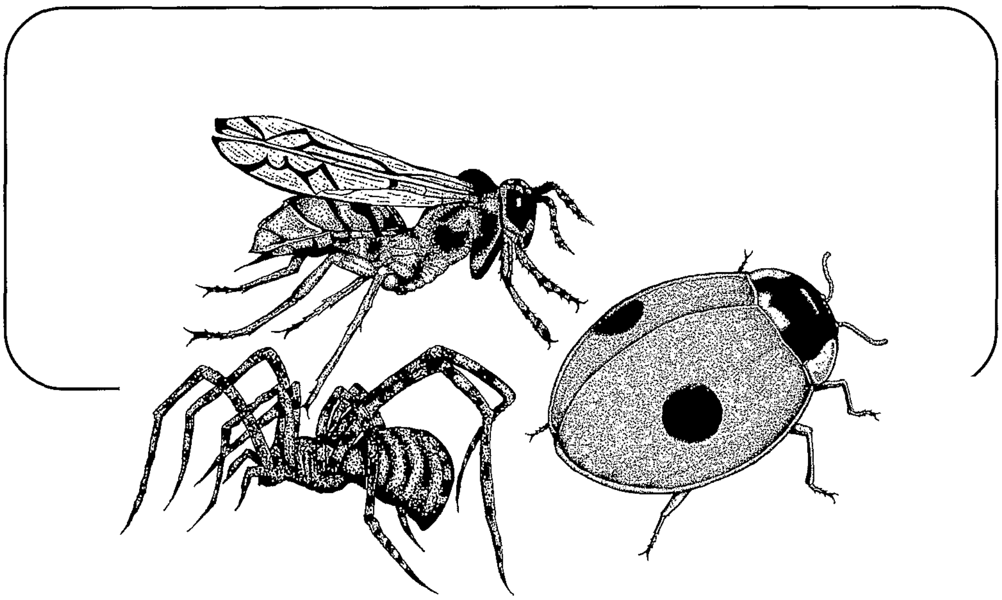
Entomology



Beneficial Arthropod Survey in Transgenic and Non-Transgenic Field Crops in Ohio

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Curtis Young, Extension Agent, IPM
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Objectives

Ohio is ranked seventh nationally in field corn and soybean production *(Agricultural Statistics, 1999)*. Approximately 3.5 million acres of corn and 4.5 million acres of soybeans are planted in Ohio each year. In the last few years, transgenic field corn acreage (primarily *Bt* corn) has reached nearly 350,000 acres (personal communication, Hal Willson), and transgenic RR soybeans acreage has exploded to nearly two million acres (personal communication, Mark Loux, OSU weed science specialist). The purpose of this study is to determine if certain non-target organisms, especially natural enemies, are being negatively impacted by either loss of potential prey, feeding on prey that have consumed transgenic tissue, or by directly consuming transgenic tissue.

Background

Thirteen transgenic (6 *Bt* corn, 1 RR corn, and 6 RR soybean) and 11 non-transgenic (5 hybrid corn and 6 conventional soybean) fields were selected for this study in the northwestern, southwestern, and central parts of Ohio. Each region had two survey sites; each site contained a pair of transgenic/non-transgenic cornfields and a pair of transgenic/non-transgenic soybean fields. One pair of cornfields in Clark County actually consisted of a *Bt* hybrid and a non-*Bt* RR hybrid. The following is a list of the study sites by county, nearest town, and field type:

Site 1. Darke County, Greenville, *Bt*/non-*Bt* Corn and RR/non-RR Soybean fields.
Site 2. Miami County, Tipp City, *Bt*/non-*Bt* Corn and RR/non-RR Soybean fields.
Site 3. Clark County, Springfield, *Bt*/non-*Bt* Corn and RR/non-RR Soybean fields.
Site 4. Champaign County,Urbana, *Bt*/non-*Bt* Corn and RR/non-RR Soybean fields.
Site 5. Wood County, Cygnet, RR/non-RR Soybean fields.
Site 6. Van Wert County, Convoy, *Bt*/non-*Bt* Corn and RR/non-RR Soybean fields.
Site 7. Hancock County, Van Buren, *Bt*/non-*Bt* Corn fields.

Methods

Sampling in the soybean fields was accomplished using a sweep net and Pherocon AM yellow sticky traps. Weekly sweep-net sampling began at the end of June and was discontinued mid August after pod set. For the first two weeks, six locations in each field were swept (two at 100, 200, and 300 feet from the field edge). From the third week through the end of the study, only four locations in each field were swept (100 and 300 feet from the field edge).

Two Pherocon AM yellow sticky traps were deployed mid-July in the same soybean fields monitored with sweep nets. The traps were attached to posts above canopy level at approximately 100 and 300 feet from the field edge. Traps were collected and replaced with fresh ones every week. Sticky trap sampling was discontinued mid-August.

Sampling in field corn also relied upon the use of Pherocon AM yellow sticky traps, which were attached to the stalk of the corn plant near the ear. Placement of the first trap within the field was at least 24 rows into the field, with the second trap placed an additional 100 feet toward the interior of the field. Both sticky traps were changed weekly in each field starting at the beginning of July and ending around mid-August.

Beneficial insects and arthropods captured in sweep-net and sticky-trap samples were identified. The sweep-net data covered 14 categories, and the sticky-trap data included 15 categories. The following are the categories used to count the insects and the arthropods collected:

Coccinella septempunctata-7	Spotted ladybird beetle
Coleomegilla maculata	Cmac ladybird beetle
Harmonia axyridis	Multi-colored Asian ladybird beetle
Cycloneda munda	No-spot ladybird beetle
Orius sp.	Insidious flower bugs and Minute pirate bugs
Parasitoid wasps	(several families)
Spiders	(several families)
Mites	(several families)
Staphylinidae	Rove beetles
Carabidae	Ground beetles
Syrphidae	Hoover flies
Cantheridae	Soldier beetles
Nabidae	Damsel bugs
Chrysopidae	Green lacewings
Hemerobiidae	Brown lacewings

Differences in the transgenic/non-transgenic field-crop natural-enemy data were statistically analyzed by technique (sweep net and sticky trap) and by crop (soybean and corn) at each site. Site data were then combined into regional data, and the regional data then combined to look for study-wide effects. Statistical analysis of data includes two-sample t-test and non-parametric Mann-Whitney median tests. All tests of significance were conducted at $P = 0.05$.

Results

Sweep-net samples collected from each pair of transgenic and non-transgenic soybean fields revealed no statistical differences for any of the 14 natural-enemy categories compared (two sample t-test). Pooling the sweep-net site data into three regions (southwest, northwest, and central) revealed no statistical difference for any of the 14 natural-enemy categories (two sample t-test). Pooling all site data together revealed no study-wide statistical difference for any of the 14 natural-enemy categories (two sample t-test). Very few of the analyzed populations were normal in distribution; therefore, a Mann-Whitney non-parametric test was run on the sweep-net data set by site, region, and over the complete study. No statistical differences between the 14 natural-enemy categories were found.

Pherocon AM yellow sticky trap data between transgenic and non-transgenic soybean fields revealed a significant increase in the number of spiders in non-transgenic fields at Champaign County (two sample t-test). Comparisons of the remaining beneficial insect categories and other sites revealed no other statistical difference. Pooling site data into regions revealed no statistical difference for any of the 15 natural-enemy categories (two sample t-test).

Combining all site data together revealed a significant increase of green lacewing adults in non-transgenic soybean fields, but none of the other 14 natural-enemy categories (two sample t-test). Very few of the analyzed populations were normal in distribution; therefore, a Mann-Whitney non-parametric test was run on the sticky-trap data set by site, region, and over the complete study. Combining two sites in the central region showed an increase of spiders in non-transgenic fields. No other statistical differences between the 14 natural-enemy categories were found.

Pherocon AM yellow sticky-trap data between transgenic and non-transgenic cornfields revealed an increase of *Orius sp.* in transgenic fields at Hancock County (two sample t-test). Comparisons of the remaining beneficial insect categories and other sites revealed no other statistical differences. Pooling site data into regions revealed no statistical difference for any of the 15 natural-enemy categories (two sample t-test). Pooling all site data together revealed no study-wide statistical differences (two sample t-test). Very few of the analyzed populations were normal in distribution; therefore, a Mann-Whitney non-parametric test was run on the sticky-trap data set by site, region, and over the complete study. No statistical differences between the 15 natural-enemy categories were found.

Summary

Three of the six sites where both RR and conventional soybeans were planted used glyphosate herbicide for either burndown or post application. Two other sites were comparisons of RR soybeans and STS soybeans. Most soybean fields were planted no-till; all soybean fields were insecticide-free. Statistically, none of the 14 natural-enemy populations collected using a sweep net were different between transgenic and non-transgenic fields. There were statistical differences in the data collected from sticky traps. Populations of spiders at the Champaign County site and green lacewing adults study-wide were significantly higher in non-transgenic soybean fields. Weed populations in these fields are a major consideration affecting beneficial insect populations in soybean fields. According to the sweep-net and sticky-trap data collected, it would appear that transgenic soybean plants have an overall neutral effect on the beneficial insects identified by this study.

Most cornfields utilized some type of minimum tillage, such as a field cultivator, and were untreated with insecticide except for three fields. Sticky-trap data from transgenic and non-transgenic cornfields revealed statistically higher *Orius sp.* at the Hancock County *Bt* corn site. Additionally, no-spot ladybird beetles, green lacewing adults, and mites were more numerous in transgenic cornfields. The remaining 11 categories of beneficial insects were higher in non-transgenic fields. More than 2,000 parasitic wasps were collected in non-transgenic cornfields, about 100 more than transgenic cornfields. Given the direct impact *Bt* corn has on European corn borer populations, various life stages of which are parasitized by several families of Hymenoptera, the effect of *Bt* corn on these organisms is minimal compared to conventional hybrid corn. This suggests the possibility that alternative hosts (prey) in these fields may be able to support them.

Of the 15 beneficial arthropods identified, there are only a few instances where any statistical difference between transgenic and non-transgenic field crops could be detected. There are instances where specific beneficial insects, both generalists and specialists, were found in greater abundance in transgenic or non-transgenic fields. Based on the data collected, very few negative impacts on beneficial arthropods may be associated with transgenic soybean and corn crops in Ohio.

Acknowledgments

We would like to thank the Champaign, Clark, Darke, Hancock, Miami, Van Wert, and Wood county Extension agents who helped identify the fields necessary for this study.

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Evaluation of Soil Insecticides in First-Year Corn

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Farm Focus / Research Coordinator

Objective

To evaluate corn yield benefit from using ProShield seed-coating technology in comparison to conventional granular insecticides in a first-year corn field that trapped western corn rootworm adults in 1999.

Background

Cooperator:	Vantage Career Center / Farm Focus
County:	Van Wert
Nearest Town:	Van Wert
Soil Type:	Hoytville silty clay loam
Drainage:	Tile – system unknown
Previous Crop:	Soybeans
Tillage:	Fall deep-tilled and spring field cultivation (2x)
Fertilizer:	190 lbs. / A UAN broadcast on 4/26/00
Soil Test:	pH 6.1, P 44 ppm, K 197 ppm
Herbicide:	PRE - Bicep II Magnum (2.1 qt. / A) Magnum + Princep 90DG (1.1 lbs. / A)
Insecticide:	See Methods
Hybrid:	Northrup King N58-D1
Planting Rate:	28,000 seeds / acre
Row Width:	30 inches
Planting Date:	May 6, 2000
Harvest Date:	October 21, 2000

Methods

Two granular insecticides, one untreated check, and a ProShield seed coating treatment were replicated five times in a randomized complete block design. Each plot contained six rows and was 680 feet long. The study was planted using a John Deere 7000 Max Emerge six-row planter. The granular insecticides were applied in a T-Band at the full-labeled rate. One treatment contained corn with a Force ST seed-coating treatment (ProShield) and was planted without the use of any additional granular insecticide. A limited sampling of the untreated checks indicated that rootworm feeding was negligible; therefore, root ratings were not taken for this study.

Harvest populations were evaluated by counting the number of plants on each side of a 17.5-feet tape at three different locations in each plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. The entire area of each plot was harvested and weighed by a calibrated weigh wagon, and grain yield was determined at 15% moisture.

Results

Harvest population and yield means for each treatment are given in the following table:

Treatment	Rate per 1,000 Feet of Row	Harvest Population	Yield
		— plants / acre —	— bu / acre —
Check	NA	27,100	145.3
ProShield	NA	27,300	145.0
Force 3G	4.0 oz	27,100	143.8
Lorsban 15G	8.0 oz	27,100	145.9
LSD ($P = 0.05$)		NS	NS
CV (<15% is credible)		1.9%	3.0%

NA = Not applicable, NS = not significant.

Summary

The threat of western corn rootworm affecting first-year corn has been well studied in Van Wert County. In 1999, the study field was planted to soybeans where Pherocon AM unbaited yellow sticky traps were placed to trap western corn rootworm adults. An average count of 0.57 western corn rootworm (WCR) adults was caught per trap per day. This is currently less than the widely accepted economic threshold of 2.0 WCR adults per trap per day. This low activity of western corn rootworms during the 1999 growing season would not be enough to warrant the need for insecticide on this first-year corn field. An insecticide study was performed on this field to evaluate yield benefit from using ProShield seed-coating technology in comparison to conventional granular insecticides and to verify the economic threshold. The results of this one-year study indicate no significant yield differences among the four treatments. These results suggest that application of granular insecticide or insecticidal seed coating to prevent western corn rootworm larva damage in first-year corn fields that do not reach economic trapping levels is unnecessary.

Acknowledgement

The authors wish to express their appreciation to Novartis for donating material used in this study.

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Evaluation of Soil Insecticides in Continuous Corn

Andy Kleinschmidt, Extension Agriculture and Natural Resources Agent
Gary Prill, Farm Focus / Research Coordinator

Objective

To evaluate corn-yield benefit from using ProShield seed-coating technology in comparison to conventional granular insecticides in continuous corn.

Background

Cooperator:	Marsh Foundation / Farm Focus	Herbicide:	PRE — Bicep II Magnum (2.1 qt. / A) + Princep 90DG (1.1 lbs. / A)
County:	Van Wert		
Nearest Town:	Van Wert		POST — Liberty (20 oz. / A) + AMS (3 lbs. / A)
Soil Type:	Hoytville silty clay loam		
Drainage:	Tile – system unknown	Insecticide:	See Methods
Previous Crop:	Corn	Hybrid:	Northrup King N58-D1
Tillage:	Fall deep-tilled and spring field cultivation (2x)	Planting Rate:	28,000 seeds / A
		Row Width:	30 inches
Fertilizer:	220 lbs. / A UAN broadcast on 4/26/00	Planting Date:	May 6, 2000
		Harvest Date:	October 20, 2000
Soil Test:	pH 6.2, P 141 ppm, K 254 ppm		

Methods

Two granular insecticides, one untreated check, and a ProShield seed-coating treatment were replicated five times in a randomized complete block design. Each plot contained six rows and was 450 feet long. The study was planted using a John Deere 7000 Max Emerge six-row planter. The granular insecticides were applied in a T-Band at the full labeled rate. One treatment contained corn with a Force ST seed-coating treatment (ProShield) and was planted without the use of any additional granular insecticide. Root ratings were taken on July 18 by digging and washing five root systems from each plot and rating those root systems using the Iowa Root Rating Scale.

Harvest populations were evaluated by counting the number of plants on each side of a 17.5-feet tape at three different locations in each plot. The average of the number of plants counted per 17.5 feet was converted to plants per acre. Each plot was harvested and then weighed by a calibrated weigh wagon, and grain yield was adjusted to 15% moisture.

Results

Root rating, harvest population, and yield means for each treatment are given in the following table:

Treatment	Rate per 1000 row feet	Root Ratings	Harvest Population	Yield
			— plants/A —	— bushels/A —
Lorsban 15G	8.0 oz	2.36 a	26,100	112.2
Force 3G	4.0 oz	2.40 ab	26,300	114.2
ProShield	NA	2.64 bc	26,900	114.7
Check	NA	2.88 c	25,700	120.2
LSD ($P = 0.05$)		0.27	NS	NS
CV (<15% is credible)		7.6%	2.7%	7.2%

Means in a column followed by the same letter are not significantly different at $P = 0.05$.
NA = Not Applicable, NS = not significant.

Summary

Rootworm pressure in this study did not reach a level of damage that is considered economic. A root rating of 3.0 or higher frequently indicates the beginning of economic loss. To prevent yield loss, an insecticide should protect the corn roots so that no more than approximately one-third of a node of roots is destroyed by western corn rootworm larva. In this study, the check strips had an average root rating of 2.88. The results of this one-year study indicate that ProShield root ratings were not significantly different from that of the untreated check. The root ratings for the Lorsban and Force treatments were significantly lower than the untreated check; however, there was not a corresponding significant difference in corn yield. Harvest population and yields were not significantly different among the four treatments, as indicated in the table above. Although the check treatment yield appears greater than the other treatment yields, it was not statistically different due to variation within the replications.

The seed-coating approach is convenient, environmentally sound, and user-friendly as compared to conventional granular insecticides. However, emphasis must remain on selecting products based on performance. Two insecticide performance indicators that producers can use are root ratings and yields. When evaluating insecticide performance, it is important to evaluate check strips with moderate to heavy rootworm pressure established in the same fields with a given insecticide. Those products that deliver the best rootworm control should be considered for those areas where rootworm damage is common or anticipated.

Acknowledgment

The authors wish to express their appreciation to Novartis for donating material used in this study.

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Corn Rootworm Insecticide Comparison

Alan Sundermeier, Extension Agriculture and Natural Resources Agent
Bruce Eisley, Integrated Pest Management Research Associate

Objective

To evaluate corn response to soil rootworm insecticides in a field following soybeans.

Background

Cooperator:	Roland and Rob Rettig	Fertilizer:	180 lbs 19-17-0 / A, 200 lbs / A K2O, 150 lbs / A N
Nearest Town:	Napoleon		
County:	Henry		
Soil type:	Millgrove loam	Herbicides:	Bicep
Tillage:	No-till	Variety:	Golden Harvest N58D1
Soil test:	pH 6.2, P 82 ppm, K 346 ppm, CEC 10.8	Planting date:	April 27, 2000
		Planting Population:	30,000 / A
Previous crop:	Soybean	Row Width:	30 inch
		Harvest Population:	See text
		Harvest date:	November 1, 2000

Methods

A randomized, complete design used four replications of three treatments. The design was duplicated at two fields about one mile apart with the same cropping history. The treatments included a check with no insecticide, corn seed encapsulated with Force insecticide, and liquid Regent insecticide applied in furrow at planting. Individual plots were 15 feet wide and 300 feet long.

On July 20, 2000, corn roots were evaluated for rootworm damage. For each treatment, five root masses were dug, washed, and inspected for rootworm damage. The Iowa scale of 1 = no damage to 3 = economic impact to 5 = severe root pruning was used.

Corn stalk population counts were taken near harvest time. Results reported are the combination of both fields and represent eight replications of each treatment.

Results

Treatments	Root Damage Index	Harvest Population (plants/A)	Yield (bu/A)
No insecticide	1.73 b	28,000 b	168.5 a
Force	1.40 a	26,500 a	169.9 ab
Regent	1.42 ab	28,750 b	174.2 b
LSD (0.05)	0.28	998	4.8

Means followed by the same letter are not significantly different.

Summary

These fields were selected because of a history of rootworm damage on past corn crops. Economic thresholds for root damage were not reached in the control treatment. This may have been due to above-average rainfall during the growing season that possibly reduced rootworm larvae numbers.

The Regent insecticide treatment had significantly better corn yield compared to no insecticide. However, the application of Regent would not have increased net return based upon the yields compared to no insecticide.

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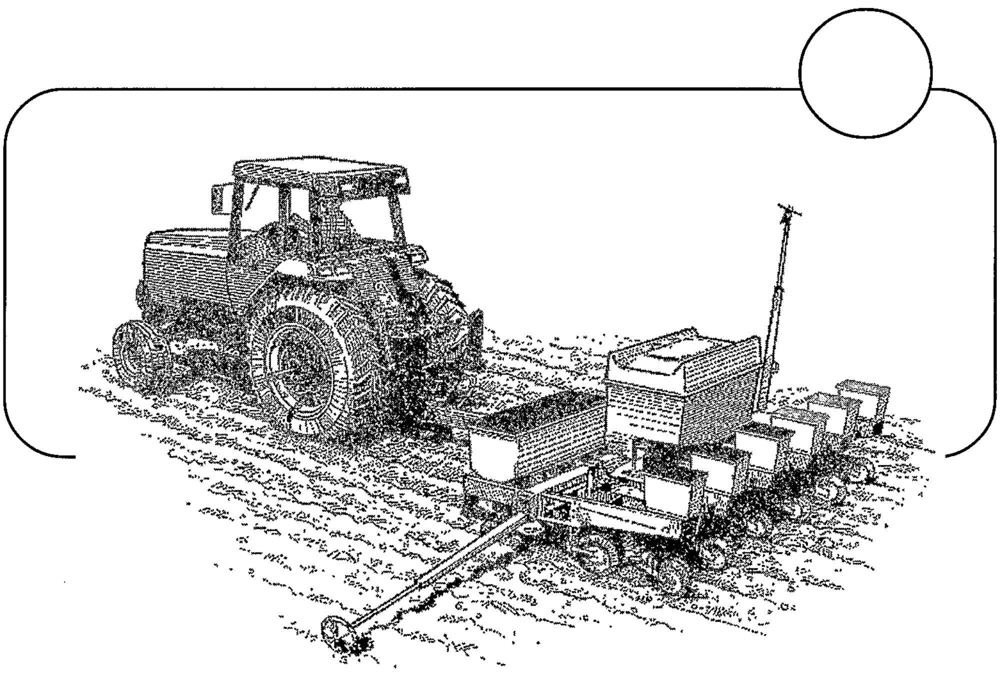
Equipment



Optimal Planter Ground Speed in Corn Production

Chris Bruynis, Extension Agriculture and Natural Resources Agent

Objective

To determine the optimal corn-planter ground speed in a conventional tillage system.

Background

Cooperator:	Dean Koehler
County of Site:	Wyandot
Nearest Town:	Upper Sandusky
Major Soil Type:	Blount silt loam
Drainage:	Surface—Minimal Tile
Tillage:	Conventional Tillage
Previous Crop:	Soybeans
Variety:	Bojac 509
Soil Test:	pH = 6.4, P = 42 lbs./A K = 263 lbs./A, O.M. = 2.3%
Fertilizer:	190 lbs/A N, 92 lbs/A P_2O_5, 120 lbs/A K_2O
Herbicide:	Axiom (18 oz/A) Atrazine Nine-O (2 lbs/A)
Planting Rate:	30,000 seeds/A
Row Width:	30 inches
Planting Date:	April 28, 2000
Harvest Date:	November 7, 2000

Methods

A 16-row, 1998 John Deere 1770 vacuum planter was calibrated, adjusted for soil conditions, and used to plant the plot. Three different ground speeds were used — 4.5, 6, and 7.5 miles per hour. During calibration, the planter monitor indicated there was a reduction in seed drop during the higher ground speeds. Vacuum pressure was adjusted to correct for this problem. Experimental design was a complete randomized block with three replications. Each treatment plot was 20-feet wide and 1,132 feet in length. Plant populations were counted nine and 17 days after planting to measure emergence differences. Yield was measured by a weigh wagon.

Results

Ground Speed (mph)	Population First Count (plants/A)	Population Second Count (plants/A)	Yield (bu/A)
4.5	28,847 a	29,814 a	177.8
6.0	26,329 b	27,879 b	177.7
7.5	23,425 c	26,910 b	177.9
F	69.3	10.9	<1
LSD (0.05)	1,280	1,755	NS
CV	2.2%	2.7%	1.2%

Means followed by the same letter are not significantly different. NS = Not Significant at $P = 0.05$.

Summary

Analysis of the data reveals that plant emergence from each planter speed was statistically different from each other for the nine days post-planting stand count. The 17-day post-planting count indicated that only the slowest ground speed was statistically different. Emergence differences are believed to be a result of seed placement and soil contact differences with slower ground speeds achieving more uniformity in both areas.

Field conditions during the growing season were generally good with adequate moisture. There was a little water stress early in the season but after full emergence of the crop. There was no noticeable difference in weed control in any of the replications with the entire plot obtaining excellent weed control.

Harvested yields were not significantly different from each other. Even though there were statistically significant differences in plant emergence, these differences had no statistical effect on the yield. Based on this research, when planting into a well-prepared seed bed and having a well-calibrated, mechanically sound planter, ground speeds between 4.5 mph and 7.5 mph have little or no effect on yields.

Acknowledgment

The author would like to thank the Farmers Commission Company for providing the weigh wagon.

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Effect of Planter Unit Repair and Calibration on Yields of Corn

Steve D. Ruhl, Extension Agriculture and Natural Resources Agent

Objective

To evaluate the effect of calibration and repair of planter units on yields of corn.

Background

Site I

Cooperator:	Tom Weiler
County:	Morrow
Nearest town:	Chesterville
Soil Type:	Sloan silty clay loam
Drainage:	Systematic
Tillage:	Conventional
Previous Crop:	Soybeans
Variety:	Golden Hrvest 2495
Soil test:	pH = 7.0, P = 23 ppm K = 154 ppm
Fertilizer:	206-70-99 actual N-P-K lbs. / A
Planting Date:	May 1, 2000
Planting Rate:	30,100 seeds / A
Harvest Date:	October 23, 2000
Herbicides:	PRE – Dual II Magnum (1 qt. / A), Atrazine (1.5 lb. / A), Balance (1.0 oz. / A) POST – Clarity (1 pt. / A)
Row width:	30 inch

Site II

Cooperator:	Steve Ruhl
County:	Morrow
Nearest town:	Williamsport
Soil Type:	Sleeth silty clay loam
Drainage:	Systematic
Tillage:	Conventional
Previous Crop:	Soybeans
Variety:	Golden Harvest 2515
Soil test:	pH = 6.5, P = 56 ppm K = 162 ppm
Fertilizer:	167-69-30 actual N-P-K lbs. / A
Planting Date:	April 29, 2000
Planting Rate:	30,100 seeds / A
Harvest Date:	October 31, 2000
Herbicides:	PRE – Bicep II Magnum (1 qt. / A), Balance (1.5 oz. / A) POST – Clarity (0.5 pt. / A)
Row width:	30 inch

Methods

Three seeding units were removed from a John Deere 7000 six-row planter. These units were calibrated and any needed repairs and adjustments were made. The calibrated units were compared to the non-calibrated units in a split-planter study. The study was replicated at two sites. The treatments were replicated four times at each site, and the entire six rows were harvested and measured using a weigh wagon. The lengths of the plots ranged from 715 to 766 feet. The speed of planting was 5 mph. The harvest population was not counted at the Chesterville site.

Results

Treatments	Site I Corn Yield (bu/A)	Site II CornYield (bu/A)	Site II Population (plants/A)
Calibrated, repaired adjusted units	158.1 a	181.8 a	28,000
Other units	146.0 b	174.8 b	26,250
LSD (0.05)	5.2	6.0	NS
F	54.8	13.9	4.2
CV (%)	1.5	1.5	4.5

Summary

The results of this study did show that the calibration and repair and adjustment of the planting units of the J.D. 7000 planter did affect yields. The calibrated, repaired units out yielded the other units by 12 and 7 bushels per acre at the two sites. Population counts at the Williamsport site were not statistically different. There were probably not enough replicates to differentiate a 5 to 6 percent difference in the stand counts.

It appears that calibration and repair of planter units can make a significant difference in corn yields. Producers should periodically calibrate, repair, and adjust seed-planting units.

Acknowledgment

The author and collaborating farmer would like to thank Pioneer Hybrids for calibrating and repairing the three units so the study could be completed. Also, thanks are extended to Royster Clark for weighing the plot at the Williamsport location.

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Appendix

A Word About Statistics

By Phil E. Rzewnicki, Ohio State University On-Farm Research Coordinator

Why Statistics?

Statistics are used to assess the variability that is always present, and then make reasonable, mathematics-based guesses as to whether or not observed effects are due to chance or to treatments.

When we conclude that there is a reasonable chance that differences were, in fact, due to treatments, then we say treatments had a *significant effect.* This conclusion does not mean that we **proved** that the treatments caused differences, only that we are satisfied that our guess is probably correct.

When we are unable to draw the conclusion that treatments differed, we say that the treatments are *not significantly different.* This does **not** mean that treatments had no effect — it simply says that our research trial was not able to detect such an effect. There are two possibilities here — either the treatments really did not have an effect, or they did have an effect, but the experiment was not adequate to detect it.

Small effects are very difficult to prove. This is due to the fact that unexplained variation or "background noise" will usually "drown out" small effects. As a means to evaluate how well a particular trial was able to control unexplained variation, we use the Coefficient of Variation or CV. It is simply the standard deviation of all samples in a trial divided by the overall mean of all samples. It is usually expressed as a percentage of the overall mean. A goal for most field trials is to achieve a CV of 12% or less. The smaller the CV or "background noise," the easier it is to detect variation due to treatments. A trial having a CV of 5% and five to six replications of each treatment will have a reasonable chance of detecting a true 10% difference between treatment means.

What Does Probability Level Mean?

If we declare two averages are "significantly different" at 5% probability level or $P = 0.05$, we are saying that we are willing to make a mistake one out of 20 times if, in fact, they are truly equal. The 5% probability level is the standard used for most field trials. However, 5% may be too conservative or overly cautious for some farmer-researchers. In some on-farm research trials, it may be decided that a wrong decision may not be very costly. This could be the case where treatment costs are essentially the same, e.g., seed costs in variety comparisons. It may be decided to use a probability level of 10% if one is willing to make a mistake one out of 10 times, or 20% for a risk of one out of five.

Picking the probability level is a "decision rule." Increasing the sample size or replicates reduces the chances of making an incorrect decision when the same decision rule is applied.

In on-farm research trials, experience has shown that five to six replicates are usually needed to detect meaningful and real differences between treatments if they exist. Each treatment is represented at least once within each replicate. Replications may be located adjacent to each other within a single field or located in separate fields or farms.

Randomization of treatments within a replicate is important to avoid biased location of treatments. Having treatments in the same order in replicates across a field may cause bias due to soil fertility trends or soil moisture trends stretching across the field.

The F-Test and Least Significant Difference

A test for significance for differences between or among treatment means is the F-test. It is the ratio of the variation due to treatments divided by the variation of individual samples. Values close to one indicate there is little or no variation due to treatments. Values much larger than one indicate that variation due to treatments is larger than expected by chance alone.

If an F value for a trial is found to be significant and there are more than two treatments being analyzed, then further testing requires calculating another test for significance called the Least Significant Difference (LSD). The LSD helps to detect which pairs of treatment means are significantly different from each other. When a trial contains more than two treatments, it is sound statistical protocol to conduct an F-test before pairwise comparisons are made with an LSD. This procedure is referred to as *Fisher's (protected)* LSD. If a trial contains only two treatments, then using an F-test to find significance is equivalent to using LSD alone.

For most trials in this report, an F-statistic was calculated first. If treatments were found to be significantly different, then an LSD is usually reported in lieu of the F value.

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