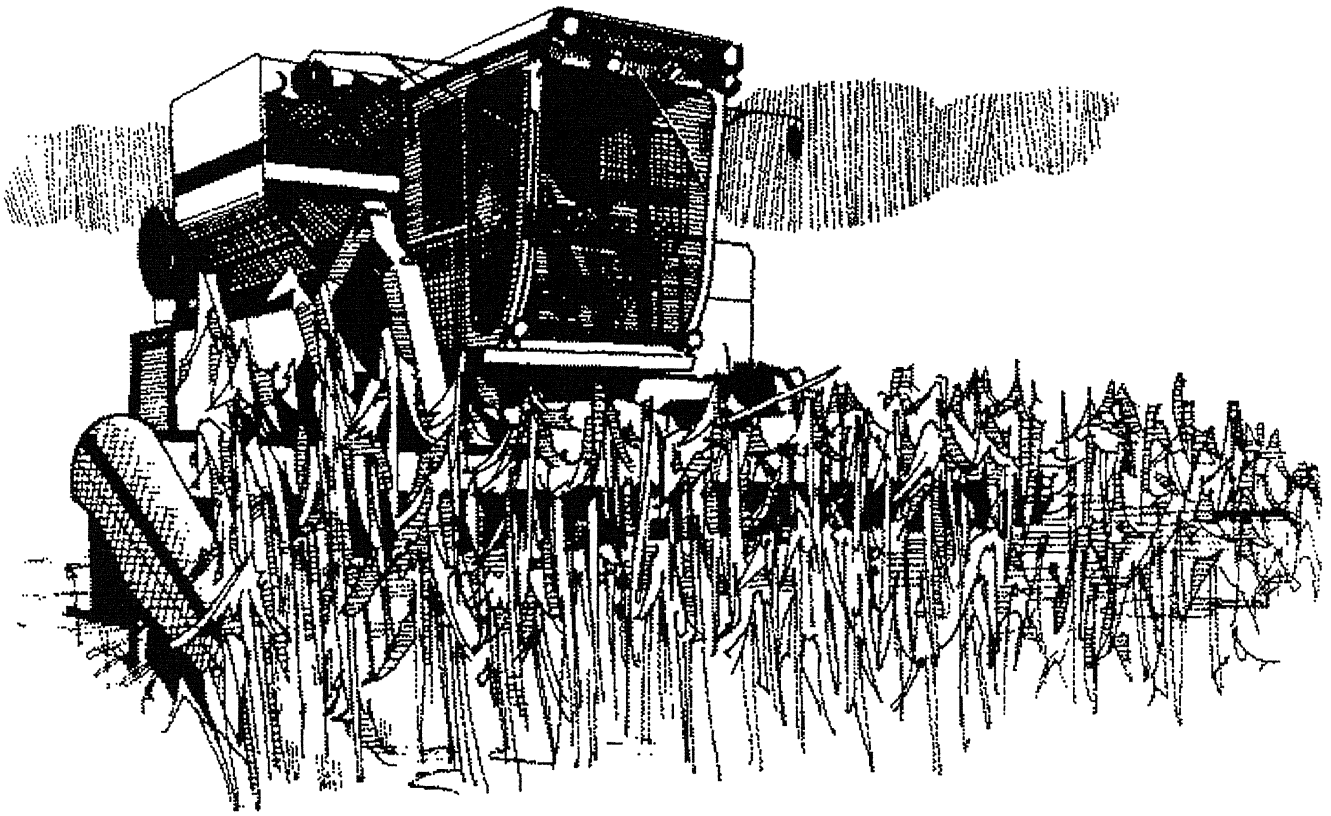
Agronomic Crops Team On-Farm Research Projects 1997



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THE OHIO STATE UNIVERSITY EXTENSION

May 1998
Special Circular 160
Ohio Agricultural Research and Development Center
In Partnership With Ohio State University Extension

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Agronomic Crops Team On-Farm Research Projects 1997

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Ohio State University Extension
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the Agricultural Industry, and Farmers

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Contents

Editors' Introduction

This booklet contains the on-farm research results of Extension agents, Extension state specialists, and researchers affiliated with the Ohio State University Extension Agronomic Crops Team. Results are primarily from experiments conducted during 1997. All but one of the research trials in the main body of the report contained at least three replications. The only exception is an extensive corn variety test that incorporated alternate check strips to account for soil variability. Several trials of general interest that did not contain a minimum of three replications are included in an appendix. It is our hope that the publishing of these applied research reports will enhance our efforts in meeting the needs of Ohio farmers and the state's agricultural industry.

Editors

Phil E. Rzewnicki, On-Farm Research Coordinator
Greg LaBarge, Extension Agent and Co-Chair, Agronomic Crops Team
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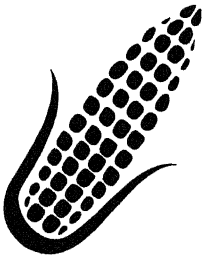
Corn



Bt Corn Yields (Morrow County)

Objective

Examine the yield performance of new Bt corn varieties.

Cooperator:	Tom Weiler	Soil Test:	pH 7.0
County of Site:	Morrow		P 23 ppm
Nearest Town:	Chesterville		K 154 ppm
Major Soil Type:	Millgrove	Fertilizer:	180# NH_3 pre-plant, 11 gallon
Drainage:	Systematic		10-34-0 + 46# P_2O_5 + 120# K_2O
Irrigation:	None	Herbicide:	Dual II - 1 qt., Atrazine 1.8#,
Tillage:	Fall chisel, field cultivate		Bladex 1.8#
Previous Crop:	Soybeans	Plant Population:	26,700
		Plant Pop. @Harvest:	25,800
		Variety:	4 Bt varieties plus non-Bt tester
		Planting Date:	April 30
		Harvest Date:	October 3

Methods and Results

Variety	# Day Corn	% Harvest Moisture	Yield Bu/Ac	% of Tester
Countrymark N6800 Bt	112	27.2	198.38	118
Countrymark N4640 Bt	103	19.9	122.74	72
Pioneer 35NO5	105	22.4	157.76	93
Pioneer 33Y09	113	28.8	174.26	103
Pioneer 3335 (Tester)	111	25.3	169.42	-

Summary and Notes

This research project was designed to study the effect of Bt corn on yield. Last year in an adjacent field, European corn borer was as bad as we had in the county. Corn borer was not a problem this year. Pioneer 3335 was used as the tester. Testers were on each side of each variety. Results are the average of three approximately quarter-acre replicated strips.

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Corn Variety Performance (Knox County)

Objective

Evaluate corn varieties including Bt hybrids for Knox County.

Cooperator:	Ron and Bill Piar	Fertilizer:	Actual 180-112-93
Nearest Town:	Mount Vernon	Herbicide:	Pre-Bicep 2.4 qt.
Major Soil Type:	Ockley Silt Loam		Spot - Exceed 1 oz.
Tillage:	Field Cultivator		- Banvel 4 oz.
Previous Crop:	Soybeans	Plant Population:	31,700
Soil Test:	pH range 6.5-7.0	Planting Date:	April 6, 1997
	P range 63-104	Harvest Date:	November 4, 1997
	K range 402-603		

Results

Standard Corn Varieties

Variety	Final Stand (#/A)	Lodging (%)	Barren (%)	Maturity[1] (days)	Moisture (%)	Actual Yield (bu/A)	Adjusted Yield[2] (bu/A)	Income[3]
Midwest 7636	28,000	0	6	109	26.8	192.3	199.1	$474.60
DeKalb 607	27,667	2	8	110	21.7	182.7	191.9	$474.16
DeKalb 604	28,333	2	0	110	22.4	182.5	186.4	$470.47
DEF 5300	30,667	4	8	111	26.6	183.4	189.8	$453.56
Pioneer 33Y18	31,667	4	2	112	26.9	182.7	188.6	$450.36
DeKalb 595	27,333	4	10	109	26.0	180.9	185.7	$449.86
DeKalb 580	32,667	2	0	108	20.0	170.5	191.1	$449.77
Callahan 7658	25,667	4	4	109	25.5	179.3	187.2	$448.33
Pioneer 3313	29,000	0	4	113	24.3	176.7	181.1	$446.98
Mycogen 2725	29,000	0	2	111	25.7	178.9	186.1	$446.26
Great Lakes 5816	21,000	0	2	108	21.8	171.0	174.4	$443.27
DeKalb 626	29,667	2	4	111	28.5	182.6	184.3	$442.83
Pioneer 3335	31,333	8	8	113	23.7	173.9	176.5	$442.47
Pioneer 3491	27,333	6	2	107	22.8	171.7	167.3	$440.76
DeKalb 560	33,000	8	14	106	21.3	166.5	169.9	$434.23
Check Average				111	25.6	171.7		$428.72
Great Lakes 6317	31,667	0	6	113	28.2	174.2	176.5	$423.62
Pioneer 34G81	28,000	2	10	106	23.3	164.9	167.6	$421.37
Callahan 7557	30,333	0	4	110	27.5	171.9	175.6	$421.06
DeKalb 546	30,000	4	8	104	21.3	158.0	158.3	$411.56
Mycogen 7250	27,333	4	2	113	31.4	172.7	172.9	$406.28
Mycogen 2674	30,000	2	8	108	23.0	157.1	161.9	$402.49
Golden Harv 2547	33,000	2	16	111	25.1	159.7	162.5	$400.80
Golden Harv 2495	29,000	0	6	108	25.9	160.7	168.7	$400.09
DeKalb 642	26,667	2	4	114	29.9	163.6	165.8	$390.96
Novartis Max21	27,667	0	12	107	23.4	147.8	156.9	$377.30
Callahan 7856	28,667	2	16	108	22.5	145.3	169.3	$374.04
Midwest 8511	28,667	0	12	112	30.3	151.5	153.9	$360.55
DEF 5666	28,667	0	10	112	31.6	145.8	149.0	$342.24

[1] Based upon company-supplied data

[2] Yield adjusted by comparing yields of check hybrid on each side of individual hybrid with the overall check average.

[3] Income per acre determined by multiplying actual yield by $2.75/bushel and subtracting a drying cost of 2.5 cents per point of moisture down to 15.5%.

Bt Corn Hybrid Trials								
Variety	Final Stand (#/A)	Lodging (%)	Barren (%)	Maturity (days)	Moisture (%)	Actual Yld. (bu/A)	Adj. Yld. (bu/A)	Income
Novartis Max454	31,667	0	2	111	23.7	193.5	197.3	$492.43
Mycogen 2787	28,000	0	4	113	25.4	191.9	195.7	$480.30
Pioneer 33Y09	30,667	0	2	111	27.1	186.2	188.0	$458.08
Becks 5505	26,667	0	2	110	29.1	183.7	184.5	$442.67
North. King 6800	31,667	2	6	112	29.6	181.1	186.3	$434.21
Novartis Max21	30,000	4	6	107	22.0	167.7	172.6	$433.90
Pioneer 33V08	31,333	2	0	110	23.4	163.3	165.4	$416.82
DeKalb 566	23,000	2	0	106	20.2	151.5	154.5	$398.90

Summary and Notes

Bt plots were planted side by side in the same portion of the test area with the check variety planted on either side of each strip. Check variety for all standard and Bt varieties was DeKalb 618.

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Liberty Herbicide on Corn

Objective

Evaluate various combinations and timing of Liberty post-emergence herbicide with atrazine for the control of grass and broadleaf weeds in corn.

Cooperator:	Tom Weiler	Soil Test:	pH 7.0
County of Site:	Morrow		P 23 ppm
Nearest Town:	Chesterville		K 154 ppm
Major Soil Type:	Millgrove	Fertilizer:	180 # NH_3 preplant + 46 # P_2O_5 +
Drainage:	Systematic		120 # K_2O + 11 gal. 10-34-0
Irrigation:	None	Plant Population:	26,700/A
Tillage:	Fall chisel and field cultivate	Plant Population @Harvest:	25,800/A
Previous Crop:	Soybeans	Variety:	Bird 63XPT
		Planting Date:	May 8
		Harvest Date:	October 30

Methods and Results

			Control Rating (%)				Costs/Ac	
Herbicides	Rate/Ac.	Growth Stage	Annual Grass	Lambs-quarters	Giant Ragweed	Herbicide $	Application $	Total $
Liberty	28 oz.	LPO				25.20	4.00	**35.97**
Atrazine	1.5 lb.	LPO	95	94	88	5.58		
AMS	2.0%w/w	LPO				1.19		
Liberty	20 oz.	LPO				18.00	4.00	**51.96**
Atrazine	1.5 lb.	LPO				5.58		
AMS	2.0%w/w	LPO	99	99	95	1.19		
Liberty	20 oz.	EPO				18.00	4.00	
AMS	2.0%w/w	EPO				1.19		
Atrazine	1.0 lb.	PRE				3.72	4.00	**30.91**
Liberty	20 oz.	LPO	95	99	89	18.00	4.00	
AMS	2.0%w/w	LPO				1.19		
Atrazine	2.0 lb.	PRE				7.44	4.00	**41.83**
Liberty	28.0 oz.	LPO	99	92	90	25.20	4.00	
AMS	2.0%w/w	LPO				1.19		
Liberty	20.0 oz.	EPO				18.00	4.00	**25.98**
Atrazine	0.75 lb.	EPO	97	99	88	2.79		
AMS	2.0%w/w	EPO				1.19		
Liberty	20.0 oz.	EPO				18.00	4.00	**46.38**
AMS	2.0%w/w	EPO	99	92	88	1.19		
Liberty	20.0 oz.	LPO				18.00	4.00	
AMS	2.0%w/w	LPO				1.19		

Continued on the next page.

All treatments were replicated four times.
Control Rating — percent of weeds controlled. Control rating values are the average of all four replications.
PRE — Pre-emergent application
EPO — Early post-emergence — weeds less than 3 inches
LPO — Late post-emergence — weeds generally in the 4- to 12-inch range
Prices used were in-season retail prices. Application cost used was $4.00 per acre. Costs may and will vary among farms.

Summary and Notes

Liberty is a new non-selective grass and broadleaf post-emergence herbicide that can be used on corn with the Liberty-linked gene incorporated in it. The Bird 63XPT variety yielded 190.3 bushels per acre. The weed pressure was severe at the evaluation site.

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Insecticide Use on First-Year Corn

Objective

Investigate the use of rootworm insecticide on first-year corn.

Cooperator:	Tom Weiler	Fertilizer:	180 # NH_3 Nitrogen pre-plant, 46# P_2O_5, 120 # K_2O, 11 gallon 10-34-0
County of Site:	Morrow		
Nearest Town:	Chesterville		
Major Soil Type:	Millgrove	Herbicide:	Dual II - 1 qt, Atrazine 1.8#, Bladex 1.8#
Drainage:	Systematic		
Irrigation:	None	Plant Population:	26,700
Tillage:	Fall chisel, field cultivate twice	Plant Pop. @Harvest:	25,800
Previous Crop:	Soybeans	Variety:	Pioneer 3335
Soil Test:	pH 7.0	Planting Date:	April 30
	P 23 ppm	Harvest Date:	October 30
	K 154 ppm		

Methods and Results

Variety	Insecticide	Rate	Yield Bu/Ac
Pioneer 3335	Force	5 oz/Ac	153.7
Pioneer 3335	None	-	150.7
		LSD (.05) = 12.9	N.S.

Summary and Notes

This research project was designed to study the effect of insecticide use on first-year corn. Force insecticide was used at the 5-oz.-per-acre rate. Pioneer 3335 was used as the corn variety. The results are the average of five side-by-side one-fifth acre plots. Each plot was six rows wide. Yield differences were not significantly different. The improvement in yield received would barely cover the cost of insecticide used. Normally in Ohio a planter-box treatment with insecticide is not recommended on first-year corn by Ohio State University.

For additional information, contact :

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Narrow Row Corn Evaluation

Objective

To determine corn grain yield response to row width in different production environments across Ohio.

Methods

Extension agents across the state found cooperators to conduct on-farm trials comparing narrow 15-inch row corn to 30-inch row corn. Plans were developed to use three or more blocks (replications) containing strips with narrow row corn planted next to conventional row corn at each site.

Results

Pre-Harvest Data

County	Row Width (in)	Row Splitters Used?	Number of Replications	Final Stand Population	% Lodging	% Barren or Nubbins	% Stalk Rot	2′ Gaps Per 100′ Row
Clark	15	No	Avg. of 3	37,000	N/A	N/A	N/A	N/A
	30		varieties	43,000	N/A	N/A	N/A	N/A
Crawford	15	(folded	3	24,000	0	N/A	N/A	N/A
	30	planter)		23,625	0	N/A	N/A	N/A
Darke	15	No	3	29,333	3.4	11.4	1.7	0.3
	30			27,333	3.6	7.3	2.4	0.3
Fulton	15	No	4	30,083	1	6	0	3.5
	30			28,667	1	4	0	0.75
Knox	15	No	4	29,400	2.0	3	47	N/A
	30			31,100	0	3	47	N/A
Licking	15	No	3	30,500	2.5	0.5	4.5	6
	30			29,500	0.5	1.3	0.5	0.5
Logan	15	No	3	21,800	9.6	19.8	2.1	12.3
	30			25,100	9.7	13.3	1.9	3.3
Morrow	15	Yes	Avg. of 4	24,750	5	2	N/A	5
	30		varieties	27,250	4	2	N/A	1
Van Wert (Pioneer)	15	Yes	3	26,136	1.3	6.7	0	15.7
	30			21,636	1.3	4.0	0.8	5
Van Wert (Beck's)	15	Yes	3	24,684	0.7	0	25.8	16
	30			24,684	1.3	4.7	10.8	4.3
Avg. over Locations	15		10	27,769	3.2	6.2	11.6	7.4
	30			28,190	2.7	5.0	9.1	2.2

Continued on the next page.

Additional Notes:
Narrow-row spacing consistency:

- Fulton County – narrow rows were 14.1" apart on average (std. dev. = 4.0")
- Licking County – narrow rows were 15.2" apart on average (std. dev. = 1.9")
- Logan County – narrow rows were 16.1" apart on average (std. dev. = 2.8")
- Darke County – narrow rows were double rows 7.6" apart on average (std. dev. = 3.0") on 29" centers

Harvest Data

County	Row Width (in)	Harvest Loss (bu/A)	Rows per Ear	Kernels per Row	Ear Length (cm)	Harvest Moisture	Yield (bu/A) (Adj 15.5%)
Clark	15	3.9	N/A	N/A	N/A	23.6	234.3
	30	2.5				25.4	206.1 **
Crawford	15	N/A	N/A	N/A	N/A	N/A	153.0
	30						163.7 n.s.
Darke	15	"	18.2	35.3	16.7	22.0	163.0
	30		16.7	40.0	17.6	21.2	143.7 n.s.
Fulton	15	"	15.9	33.9	N/A	25.8	179.8
	30		16.3	30.6		25.8	187.3 n.s.
Knox	15	"	N/A	N/A	"	23.6	179.5
	30					23.7	179.4 n.s.
Licking	15	"	"	"	"	18.5	148.5
	30					18.8	143.6 n.s.
Logan	15	"	"	"	"	21.2	142.8
	30					21.4	155.0 n.s.
Morrow	15	1.6	"	"	"	29.2	118.1
	30	0.2				30.3	127.1 n.s.
Van Wert (Pioneer)	15	1.8	"	"	"	26.2	133.6
	30	1.2				25.5	143.7 n.s.
Van Wert (Beck's)	15	1.9	"	"	"	25.0	132.4
	30	1.2				25.0	134.3 n.s.
Avg. over Locations	15	2.3	17.1	34.6		23.9	158.5
	30	1.3	16.5	35.3		24.0	158.4 n.s.

** Significant at 0.01 probability level

Summary and Notes

At all but one location there were no significant yield differences between the two-row-width treatments at the 5% level of probability. There was also no significant difference in yield when analyzed over all locations. Further work needs to be done to determine the effect on yield if the plant population of narrow-row-width corn is increased above conventional seeding rates. Future multi-location studies may also examine differences in variety performance and weed control in narrow-row corn systems.

The Agronomic Crops Team would like to thank the following cooperators and agents for their participation in this multi-location study:

County	Cooperator	Extension Agent
Clark	Ira and Steve Rust, Springfield	Mike Haubner
Crawford	Dr. Steve Prochaska	Dr. Steve Prochaska
Darke	Dennis Baker	Dennis Baker
Fulton	Richard Snyder, Delta	Greg LaBarge
Knox	Ron and Bill Piar	John Barker
Licking	Mike Thomas, Baltimore	Howard Siegrist
Logan	Mac-O-Creek Farms, Jim Patton	Tammi Dobbels
Morrow	Steve Ruhl	Steve Ruhl
Van Wert	Dr. Tom Krill	Mark Schumm

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Row Starter Compared to Broadcast P&K on Corn

Objective

To compare corn-yield performance under two different fertilizer programs.

Cooperator:	Dennis Baker
County of Site:	Darke
Nearest Town:	Greenville
Major Soil Type:	Miami
Drainage:	Subsurface
Irrigation:	None
Tillage:	No-till
Previous Crop:	Wheat
Soil Test:	pH 7.0
	P 46
	K 206

Fertilizer Applied: 190# 7-34-20, 150#N sidedr ess
Herbicide Program: 5 qt. Extrazine and 1 pt. Weedone applied on one replication with water on 4/30/97 and on the other two replications on 5/17/97 with 28% N.
Plant Population: 28,000
Plant Population @Harvest: Not Available
Variety: Pioneer 3313
Planting Date: April 23
Harvest Date: Oct. 21

Materials and Methods

These plots compared row-applied N-P-K fertilizer to row-applied N only with P and K broadcast. Plots were field length replicated three times and completely randomized.

Results

Treatments	Yield
Row N-P-K	82.3 bu./A
Row N/Broadcast P&K	82.1 bu./A

No significant difference with lsd of 6.2 bu/A at the 5% level of probability. Coefficient of variation equaled 2.1%.

Summary and Notes

Low corn yields were due primarily to wet conditions at planting as well as dry conditions in July and August. Corn did not tassel until late July.

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OSU Extension Manure Management Trials Using the Pre-Sidedress N Soil Test

Prepared by
Donald J. Eckert

During winter 1997, the Ohio State University Extension Agronomy and Waste Management Teams considered the idea of conducting county-level field trials to refine manure management techniques used by farmers in Ohio. The teams decided to investigate using the pre-sidedress nitrogen soil test (PSNT) as a guide to adding extra N to fields that had received manure prior to cropping. Don Eckert, from the School of Natural Resources, proposed that agents conduct simple studies in which plots receiving manure would be tested for nitrate-N when corn was one-foot tall, and yields from those plots compared to yields from adjacent plots receiving adequate N for optimum yield. Relative yield (yield on manure-only plots divided by that on non-N-limiting plots) would be related to soil nitrate concentration. The objective was to determine whether a soil nitrate concentration existed above which corn would not respond to additional nitrogen (i.e., relative yield was close to 100%). Jim Skeeles, Lorain County agent, agreed to coordinate project efforts.

Four county Extension agents participated in the full project, laying out plots on private farms, collecting soils for analysis, and reporting yields at harvest. The agents were Steve Bartels (Butler County), Mike Haubner (Clark County), John Smith (Auglaize County), and Barry Ward (Marion County). Seneca Soil and Water Conservation District (SWCD) also participated in the study; however, yields were not reported. All field operations were conducted by cooperating farmers (and the Ohio Agricultural Research and Development Center's Western Branch farm crew at one site in Clark County). Soil samples, taken to a depth of one foot when corn was one-foot tall, were air-dried and analyzed for water-extractable nitrate by the Ohio State University Research-Extension Analytical Laboratory using ion chromatography.

Experimental sites were located on important soil series of western Ohio (Table 1). All received moderate to high rates of manure (dairy, cattle, or hog), applied within six months of planting. Manure was broadcast at three sites and injected in bands in Auglaize County. The corn planted on sampled plots in Butler and Marion Counties received some fertilizer N in addition to manure. Records indicate that plots in Clark and Auglaize Counties received only manure.

Donald J. Eckert, School of Natural Resources, The Ohio State University, Columbus, Ohio 43210.

Table 1. Aspects of County Studies of the Role of the PSNT in Manure Management.

County	Soil	Manure Type	Manure Rate	Time of Application	Additional N
Auglaize	Blount	Dairy liquid	20,000 gal injected	Fall	None
Butler	Celina/Crosby	Dairy 30% solid	4 tons	Spring	43 lb in row
Clark	Crosby/Brookston	Hog/Site 1	23,000 gal	Spring	None
		Hog/Site 2	10-23,000 gal	Spring	None
		Cattle/Site 3	10,000	Spring	30 gal 28% N
Marion	Pewamo	Dairy liquid/dry	5,000 gal liquid plus solid	Spring	75 lb broadcast with herbicides

There was no relationship between actual yields and PSNT nitrate-N concentrations, when all data were pooled (Figure 1). Yields at Clark County sites did increase as PSNT nitrate concentration increased ($r = 0.95$), but the relationship was not maintained when data from the other counties were included. This is likely due to the small number of cases in other counties, and perhaps variability in yield potential between sites and plots within sites. When relative yields were calculated by dividing individual plot yields by the highest yield at the site, there was also some relationship between relative yields and PSNT nitrate in Clark County ($r = 0.91$) but not in the data set as a whole (Figure 2). Relative yields greater than 90% were obtained at PSNT-nitrate concentrations ranging from 7 to 24 ppm; however, relative yields lower than 85% were also obtained across the same range. There was no way to determine an overall nitrate sufficiency level (above which corn would not respond to additional N) from the data collected in this study.

There could be several reasons why the data from this group of studies were inconclusive. One is the repeated observation at Ohio Agricultural Research and Development Center experiment stations that critical PSNT-nitrate concentrations can vary somewhat from site to site in a given year, and year to year at a given site, when experiments were conducted using manufactured fertilizer rather than manure. Such an effect could be operating in this situation, also. Another likely possibility is that rather high rates of manure were used in the studies, making it difficult to generate anything resembling a response curve from the pooled data. In addition, the very wet weather during the spring probably slowed N mineralization and nitrification, leading to a situation where nitrate concentrations measured in June underestimated the quantity of N eventually provided by the manure. Differing rainfall and drainage at the different sites could have compounded these effects and the resulting variability. "Normally," one would expect higher nitrate concentrations from the quantities of manure applied than were seen in the soil samples tested. If the teams decide to repeat these studies, two modifications might help produce more useful data.

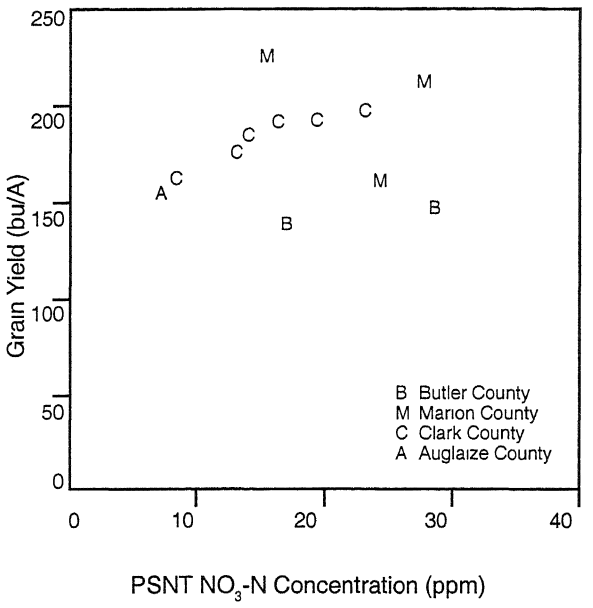

Figure 1. Yield v: nitrate-N concentration on manured plots.

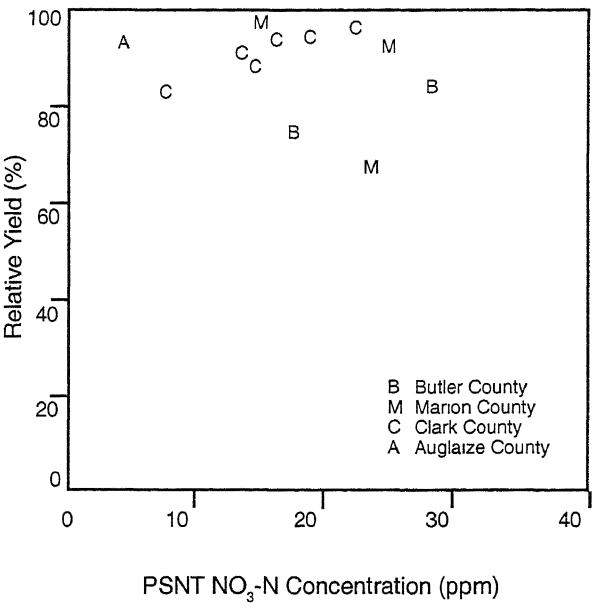

Figure 2. Relative yield v. nitrate-N concentration on manured plots.

One is to recruit more agents and cooperators, so more data points are available. Increasing the quantity of data available increases the probability of generating significant and useful relationships. The other suggestion would be to reduce the rates of manure used on some sites, perhaps using a low and high rate at a location, and obtaining soil tests and yields from both. This will increase the probability of obtaining data that will generate a response curve and allow identification of a sufficiency level for PSNT-nitrate.

Soybean

Liberty Soybean Herbicide Trial

Objective

Evaluate various programs of Liberty post-emergence herbicide applied alone and combined with pre-emergence herbicides in a Liberty-resistant soybean stand.

Cooperator:	Tom Weiler	Soil Test:	pH 7.0
County of Site:	Morrow		P 23 ppm
Nearest Town:	Chesterville		K 154 ppm
Major Soil Type:	Millgrove	Fertilizer:	250# 0-0-60
Drainage:	Systematic	Herbicide:	Liberty
Irrigation:	None	Plant Population:	201,000
Tillage:	Fall chisel and field cultivator and packer	Plant Pop. @Harvest:	145,000
		Variety:	Asgrow 2704LL
Previous Crop:	Corn	Planting Date:	May 8
		Harvest Date:	October 9

Methods and Results

Herbicides	Rate/Ac	Growth Stage	Annual Grass	Lambs-quarters	Giant Ragweed	Velvet-leaf	Herbi-cides	Applica-tion	Total
Canopy	3.0 oz.	PRE					7.88	4.00	**42.27**
Liberty	28.0 oz	LPO	99	99	98	99	25.20	4.00	
AMS	2.0%w/w	LPO					1.19		
Liberty	20.0 oz.	EPO					18.00	4.00	**46.38**
AMS	2.0%w/w	EPO	99	99	99	99	1.19		
Liberty	20.0 oz.	LPO					18.00	4.00	
AMS	2.0%w/w	LPO					1.19		
Command	1.0 qt.	PRE					9.00	4.00	**36.19**
Liberty	20.0 oz.	LPO	99	99	97	99	18.00	4.00	
AMS	2.0%w/w	LPO					1.19		
Canopy XL	3.2 oz.	PRE					8.44	4.00	**35.63**
Liberty	20.0 oz.	LPO	99	99	99	99	18.00	4.00	
AMS	2.0%w/w	LPO					1.19		
Liberty	28.0 oz.	LPO	99	98	95	98	25.20	4.00	**30.39**
AMS	2.0%w/w	LPO					1.19		

Control Rating — percent of weeds controlled
PRE — Pre-emergent application
EPO — Early post-emergence — weeds less than 3 inches
LPO — Late post-emergence — weeds generally in the 4- to 12-inch range
Application cost used was $4.00 per acre. Costs may and will vary among farms.

Summary and Notes

Liberty is a new non-selective herbicide that can be sprayed post-emergence to control grass and broadleaf weeds. The soybean variety must have the gene incorporated in it to allow the use of Liberty. The results on weeds are quicker than Roundup with noticeable symptoms within 48 hours.

The results of the treatments are the average of four replications. Each rep. was 10' x 40'. The weed pressure in the field was moderate. In a harvest check the Asgrow 2704LL beans yielded 56.5 bushels per acre.

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Roundup Ready Soybean Herbicide Trial

Objective

Evaluate various combinations of Roundup Ultra with pre-emergent herbicides and other post-emergence programs for the control of grass and broadleaf weeds in Roundup Ready soybeans.

Cooperator:	Tom Weiler	Soil Test:	pH	7.0
County of Site:	Morrow		P	23 ppm
Nearest Town:	Chesterville		K	154 ppm
Major Soil Type:	Millgrove	Fertilizer:	None	
Drainage:	Systematic	Plant Population:	204,000/A	
Irrigation:	None	Plant Pop. @Harvest:	154,000/A	
Tillage:	Fall chisel and field cultivate twice	Variety:	Stine 3264RR and Pioneer 9333RR	
Previous Crop:	Corn	Planting Date:	May 8	
		Harvest Date:	October 9	

Methods and Results

			Control Rating (%)				Costs ($/Ac)		
Herbicides	**Rate/Ac**	**Growth Stage**	**Annual Grass**	**Lambs-quarters**	**Giant Ragweed**	**Velvet-leaf**	**Herbi-cides**	**Applica-tion**	**Total**
Roundup Ultra	1 qt.	LPO	99	99	91	93	13.00	4.00	**17.00**
Roundup Ultra	1.5 pt.	LPO	99	98	97	96	9.75	4.00	**13.75**
Roundup Ultra	1.0	EPO	98	98	96	95	6.50	4.00	**21.00**
	1.0	LPO					6.50	4.00	
Canopy	3.0 oz.	PRE	99	99	96	97	7.88	4.00	**22.38**
Roundup Ultra	1.0 pt.	LPO					6.50	4.00	
Roundup Ultra	0.5 pt.	EPO	99	91	96	85	3.25	4.00	**16.13**
Roundup Ultra	0.75 pt.	LPO					4.88	4.00	
Canopy XL	3.0 oz.	PRE	99	99	98	98	8.44	4.00	**22.94**
Roundup Ultra	1.0 pt.	LPO					6.50	4.00	
Dual II	1.0 qt	PRE	92	86	99	97	17.50	4.00	**27.07**
Firstrate	0.33 oz.	LPO					*	4.00	**+?**
COC	1.0 qt	LPO					1.18		
28% N	.2.5%v/v	LPO					0.39		
Dual II	1.0 qt.	PRE	99	78	95	93	17.50	4.00	**41.28**
Flexstar	2.5 pt.	LPO					15.00	4.00	
MSO	1.0%v/v	LPO					0.78		
Cobra	8.0 oz.	LPO	89	74	95	90	8.38	4.00	**25.75**
Select	8.0 oz.	LPO					12.19		
CBC	1.0%v/v	LPO					1.18		

Continued on the next page.

Control Rating — percent of weeds controlled
PRE — Pre-emergent application
EPO — Early post-emergence — weeds less than 3 inches
LPO — Late post-emergence — weeds generally in the 4- to 12-inch range
* Price of Firstrate unknown
Application cost used was $4.00 per acre. Costs may and will vary among farms.

Summary and Notes

Using Roundup-Ready soybeans with Roundup Ultra is another weed control option for soybean producers. Roundup can be used post-emergent on varieties with the gene incorporated in it. Herbicide prices were in-season retail prices. The ratings are the average of four replications in the study. The plots were 40' x 10' in size. The Pioneer 9333 RR beans ran 53.8 bushels per acre and Stine 3264RR produced 58.1 bushels per acre. The weed plots had moderate weed pressure from all the weeds rated.

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1997 Reduced Rates of Herbicides in Roundup-Ready Soybeans

Objective

Determine if reduced rates of herbicides can provide adequate weed control and show no yield loss in no-tillage soybean utilizing pre-emergence and post-emergence herbicide applications.

Cooperator:	Jim Patton
County of Site:	Logan
Nearest Town:	Belle Center
Major Soil Type:	Paulding Clay
Drainage (List Type):	N/A
Irrigation:	No
Tillage:	None
Previous Crop:	Soybean

Soil Test:	pH	N/A
	P	N/A
	K	N/A
Fertilizer Applied:		N/A
Herbicide Program:		Listed in table
Plant Population:		210,000 seeds per acre
Plant Population @Harvest:		N/A
Variety: Asgrow 3301 (Roundup-Ready)		
Planting Date:		May 14, 1997
Harvest Date:		October 15, 1997

Materials and Methods

The plot size for this study was 20 feet wide and 300 feet in length. Each treatment was replicated three times. 2,4-D ester at 1.0 pt/A plus Prime Oil (COC) was added to treatments 1–7 and applied alone to treatment 8 to control existing weeds 29 days prior to planting. The 1X Canopy rate was 6.0 oz/A and 1X Squadron rate was 3.0 pt/A. The post-emergence application of Roundup Ultra at 1X rate was 1.5 pt/A and applied based upon the broadleaf weed height listed in the table. Annual grass height was 1.25" for 1/4X rate, 3.5" for 1/2X rate, and 7.0" for 1X rate.

Results

Continued on the next page.

Treatment and Rate[1]			Treatment Timing[1]		Weed Control on August 4, 1997[1]		Soybean	Treatment
			Height	DAP	An. Gr.	C. Rag.	Yield[1]	Cost[2]
			(inch)		(——— % ———)		(bu/A)	($/A)
1. Canopy	(EPP)	1/2X		- 29				
	(POST)	1/4X	≤ 1	33	87	100	53	23.78
2. Canopy	(EPP)	1/2X		- 29				
	(POST)	1/2X	≤ 2	40	98	100	52	26.00
3. Canopy	(EPP)	1/2X		- 29				
	(POST)	1X	3-5	49	100	100	53	30.44
4. Squadron	(EPP)	1/2X		- 29				
	(POST)	1/4X	≤ 1	33	85	92	53	28.72
5. Squadron	(EPP)	1/2X		- 29				
	(POST)	1/2X	≤ 2	40	97	96	53	30.94
6. Squadron	(EPP)	1/2X		- 29				
	(POST)	1X	3-5	49	98	99	53	35.38
7. Squadron	(EPP)	1X		- 29	77	55	52	29.16
8. Roundup	(POST)	1X	3-5	42	98	100	52	23.21
LSD (0.05%)					6.5	7	NS	

[1] Abbreviations: Height = broadleaf weed height, DAP = days after planting, An. Gr. = annual grass (giant foxtail, yellow foxtail, and fall panicum), C. Rag. = common ragweed, bu/A = bushels per acre, EPP = early pre-plant application, POST = post-emergence application, LSD = least significant difference, NS = no significant difference.

[2] Treatment cost = cost of all herbicides and additives (including burndown), application cost at $2.00/A/application, and Roundup-Ready technology fee of $7.50/A.

Summary and Notes

The weed pressure in this study was light. The reduced annual grass control in treatments 1 and 4 is due to the lack of rapid soybean canopy closure after application, because the soybeans were only at the second trifoliate at application. Despite the lower weed control in treatments 1, 4, and 7, there was no significant reduction in yield.

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1997 Reduced Rates of Herbicides in Roundup-Ready Soybeans

Objective

Determine if reduced rates of herbicides can provide adequate weed control and show no yield loss in no-tillage soybean utilizing pre-emergence and post-emergence herbicide applications.

Cooperator:	John Linville
County of Site:	Champaign
Nearest Town:	Woodstock
Major Soil Type:	Brookston Silty Clay Loam
Drainage (List Type):	N/A
Irrigation:	No
Tillage:	None
Previous Crop:	Corn

Soil Test:	pH	N/A
	P	N/A
	K	N/A
Fertilizer Applied:		N/A
Herbicide Program:		Listed in table
Plant Population:		200,000 seeds per acre
Plant Population @Harvest:		N/A
Variety:		Pioneer 9396 (Roundup-Ready)
Planting Date:		May 11, 1997
Harvest Date:		October 11, 1997

Materials and Methods

The plot size for this study was 20 feet wide and 300 feet in length. Each treatment was replicated three times. 2,4-D ester at 1.0 pt/A plus Prime Oil (COC) was added to treatments 1–7 and applied alone to treatment 8 to control existing weeds 23 days prior to planting. The 1X Canopy rate was 6.0 oz/A and 1X Squadron rate was 3.0 pt/A. The post-emergence application of Roundup Ultra at 1X rate was 1.5 pt/A and applied based upon the broadleaf weed height listed in the table. Annual grass height was 2.0" for 1/4X rate, 3.5" for 1/2X rate, and 6.5" for 1X rate.

Results

Continued on the next page.

Treatment		Treatment Timing[1]		Weed Control on August 4, 1997[1]			Soybean	Treatment
and Rate[1]		Height	DAP	An. Gr.	Vol. Corn	Velvetleaf	Yield[1]	Cost[2]
		(inch)		(——— % ———)			(bu/A)	($/A)
1. Canopy	(EPP) 1/2X		- 23					
	(POST) 1/4X	≤ 1	40	89	89	94	67	23.78
2. Canopy	(EPP) 1/2X		- 23					
	(POST) 1/2X	≤ 2	47	94	99	99	63	26.00
3. Canopy	(EPP) 1/2X		- 23					
	(POST) 1X	3-5	57	100	100	96	66	30.44
4. Squadron	(EPP) 1/2X		- 23					
	(POST) 1/4X	≤ 1	40	86	90	83	69	28.72
5. Squadron	(EPP) 1/2X		- 23					
	(POST) 1/2X	≤ 2	47	97	100	96	67	30.94
6. Squadron	(EPP) 1/2X		- 23					
	(POST) 1X	3-5	57	99	100	83	67	35.38
7. Squadron	(EPP) 1X		- 23	84	20	83	66	29.16
8. Roundup	(POST) 1X	3-5	51	97	100	99	66	23.21
LSD (0.05%)				5	2	10	NS	

[1] Abbreviations: Height = broadleaf weed height, DAP = days after planting, An. Gr. = annual grass (giant foxtail, barnyardgrass, and fall panicum), Vol. Corn = volunteer corn, bu/A = bushels per acre, EPP = early pre-plant application, POST = post-emergence application, LSD = least significant difference, NS = no significant difference.

[2] Treatment cost = cost of all herbicides and additives (including burndown), application cost at $2.00/A/application, and Roundup-Ready technology fee of $7.50/A.

Summary and Notes

The weed pressure in this study was light to moderate. In treatments 4 and 6, some velvetleaf plants were nearly two times taller than were targeted at time of application because the lower control provided by Squadron and Roundup was less effective on these plants. The reduced annual grass control in treatments 1 and 4 is due to the lack of rapid soybean canopy closure after application, because the soybeans were only at the second trifoliate at application.

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1997 Reduced Rates of Herbicides in Normal Soybeans

Objective

Determine if reduced rates of herbicides can provide adequate weed control and show no yield loss in no-tillage soybean utilizing pre-emergence and post-emergence herbicide applications.

Cooperator:	John Shawhan	Soil Test: pH	N/A
County of Site:	Greene	P	N/A
Nearest Town:	Selma	K	N/A
Major Soil Type:	Celina Silt Loam	Fertilizer Applied:	N/A
Drainage (List Type):	N/A	Herbicide Program:	Listed in table
Irrigation:	No	Plant Population:	240,000 seeds per acre
Tillage:	None	Plant Population @Harvest:	N/A
Previous Crop:	Corn	Variety:	Settlemyre 3795
		Planting Date:	April 26, 1997
		Harvest Date:	October 15, 1997

Materials and Methods

The plot size for this study was 20 feet wide and 300 feet in length. Each treatment was replicated three times. 2,4-D ester at 1.0 pt/A plus Prime Oil (COC) was added to treatments 1–7 and applied alone to treatment 8 to control existing weeds four days prior to planting. The 1X Canopy rate was 6.0 oz/A and 1X Squadron rate was 3.0 pt/A. For treatments 1 and 4, only Select + Prime Oil (COC) at 2.0 oz/A + 1.0%v/v was applied as no broadleaf weeds were present. The post-emergence application of Basagran + Flexstar + Select + Priority MSO + 28% Nitrogen at the 1X rate was 1.0 pt/A + 1.0 pt/A + 8.0 floz/A + 1.0%v/v + 2.5%v/v and was applied at the listed rate to treatments 2, 3, 5, 6, and 8.

Results

Continued on the next page.

Treatment and Rate[1]			Treatment Timing[1]		Weed Control on July 24, 1997[1]		Soybean Yield[1]	Treatment Cost[2]
			Height	DAP	An. Gr.	H. Milk.		
			(inch)		(———— % ————)		(bu/A)	($/A)
1. Canopy	(EPP)	1/2X		- 4				
	(POST)	1/4X	≤ 1	32	64	0	64	17.86
2. Canopy	(EPP)	1/2X		- 4				
	(POST)	1/2X	≤ 2	55	78	27	63	31.19
3. Canopy	(EPP)	1/2X		- 4				
	(POST)	1X	3-5	72	98	77	62	46.95
4. Squadron	(EPP)	1/2X		- 4				
	(POST)	1/4X	≤ 1	32	75	0	64	22.80
5. Squadron	(EPP)	1/2X		- 4				
	(POST)	1/2X	≤ 2	55	77	23	66	36.13
6. Squadron	(EPP)	1/2X		- 4				
	(POST)	1X	3-5	72	96	67	62	51.89
7. Squadron	(EPP)	1X		- 4	76	0	63	29.16
8. Roundup	(POST)	1X	3-5	59	83	29	62	39.72
LSD (0.05%)					10	15	NS	

[1] Abbreviations: Height = annual grass height, DAP = days after planting, An. Gr. = annual grass (giant foxtail), H. Milk. = honeyvine milkweed, bu/A = bushels per acre, EPP = early pre-plant application, POST = post-emergence application, LSD = least significant difference, NS = no significant difference.

[2] Treatment cost = cost of all herbicides and additives (including burndown) and application cost at $2.00/A/application.

Summary and Notes

The annual grass pressure was moderate to heavy and the annual broadleaf pressure was nearly non-existent. Only treatments 3, 6, and 8 provided greater than 82% annual grass control on July 24, but all treatments except treatment 1 provided greater than 82% annual grass control on September 29 (data not shown). This improvement in control over time was apparently due to effects of disease on the small grasses, promoted by large amounts of rain in July and August. This may explain why there was no significant difference in yield, despite the poor control recorded in July.

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1997 Reduced Rates of Herbicides in Normal Soybeans

Objective

Determine if reduced rates of herbicides can provide adequate weed control and show no yield loss in no-tillage soybean utilizing pre-emergence and post-emergence herbicide applications.

Cooperator:	Bob Swetland	Soil Test:	pH	N/A
County of Site:	Morrow		P	N/A
Nearest Town:	Sparta		K	N/A
Major Soil Type:	Bennington Silt Loam	Fertilizer Applied:	N/A	
Drainage (List Type):	N/A	Herbicide Program:	Listed in table	
Irrigation:	No	Plant Population:	223,000 seeds per acre	
Tillage:	None	Plant Population @Harvest:	N/A	
Previous Crop:	Corn	Variety:	Pioneer 9393	
		Planting Date:	May 13, 1997	
		Harvest Date:	October 11, 1997	

Materials and Methods

The plot size for this study was 20 feet wide and 300 feet in length. Each treatment was replicated three times. 2,4-D ester at 1.0 pt/A plus Prime Oil (COC) was added to treatments 1–7 and applied alone to treatment 8 to control existing weeds 22 days prior to planting. The 1X Canopy rate was 6.0 oz/A and 1X Squadron rate was 3.0 pt/A. The post-emergence application of Basagran + Flexstar + Select + Priority MSO + 28% Nitrogen at the 1X rate was 1.0 pt/A + 1.0 pt/A + 8.0 floz/A + 1.0%v/v + 2.5%v/v and applied based on broadleaf weed height as listed in the table. Annual grass height was 1.25" for 1/4X rate, 3.0" for 1/2X rate, and 6.0" for 1X rate.

Results

Continued on the next page.

Treatment and Rate[1]			Treatment Timing[1]		Weed Control on August 6, 1997[1]		Soybean	Treatment
			Height	DAP	An. Gr.	An Br.	Yield[1]	Cost[2]
			(inch)		(——— % ———)		(bu/A)	($/A)
1. Canopy	(EPP)	1/2X		- 22				
	(POST)	1/4X	≤ 1	43	99	97	57	23.31
2. Canopy	(EPP)	1/2X		-22				
	(POST)	1/2X	≤ 2	48	100	100	60	31.19
3. Canopy	(EPP)	1/2X		- 22				
	(POST)	1X	3-5	60	99	99	58	46.95
4. Squadron	(EPP)	1/2X		- 22				
	(POST)	1/4X	≤ 1	37	90	82	57	28.25
5. Squadron	(EPP)	1/2X		- 22				
	(POST)	1/2X	≤ 2	41	96	92	59	36.13
6. Squadron	(EPP)	1/2X		- 22				
	(POST)	1X	3-5	48	100	93	57	51.89
7. Squadron	(EPP)	1X		- 22	71	80	55	29.16
8. Roundup	(POST)	1X	3-5	48	99	95	53	39.72
LSD (0.05%)					5.6	8	NS	

[1] Abbreviations: Height = annual broadleaf height, DAP = days after planting, An. Gr. = annual grass (giant foxtail and fall panicum), An. Br. = annual broadleaf weeds (giant ragweed, common ragweed, and velvetleaf), bu/A = bushels per acre, EPP = early pre-plant application, POST = post-emergence application, LSD = least significant difference, NS = no significant difference.

[2] Treatment cost = cost of all herbicides and additives (including burndown) and application cost at $2.00/A/application.

Summary and Notes

The annual grass pressure was moderate to heavy and the annual broadleaf pressure was light to moderate. All treatments provided greater than 91% control of weeds except for treatments 4 and 7. Despite this lower control, there was no significant yield reduction. There was great variability in soybean stand caused by Phytophthora root rot, which is why there was no significant yield reduction where weed control was reduced.

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1997 Reduced Rates of Herbicides in Normal Soybeans

Objective

Determine if reduced rates of herbicides can provide adequate weed control and show no yield loss in no-tillage soybean utilizing pre-emergence and post-emergence herbicide applications.

Cooperator: Tim Warner
County of Site: Darke
Nearest Town: Greenville
Major Soil Type: Brookston Silty Clay Loam
Drainage (List Type): N/A
Irrigation: No
Tillage: None
Previous Crop: Corn

Soil Test: pH N/A
P N/A
K N/A
Fertilizer Applied: N/A
Herbicide Program: Listed in table
Plant Population: 210,000 seeds per acre
Plant Population @Harvest: N/A
Variety: Becks 299
Planting Date: April 29, 1997
Harvest Date: September 24, 1997

Materials and Methods

The plot size for this study was 20 feet wide and 300 feet in length. Each treatment was replicated three times. 2,4-D ester at 1.0 pt/A plus Prime Oil (COC) was added to treatments 1–7 and applied alone to treatment 8 to control existing weeds seven days prior to planting. The 1X Canopy rate was 6.0 oz/A and 1X Squadron rate was 3.0 pt/A. The post-emergence application of Basagran + Poast HC + Prime Oil + 28% Nitrogen at the 1X rate was 2.0 pt/A + 10.0 floz/A + 0.5%v/v + 2.0%v/v and applied as listed in the table.

Results

Continued on the next page.

Treatment and Rate[1]			Treatment Timing[1]		Weed Control on July 24, 1997[1]	Soybean	Treatment
			Height	DAP	An. Gr.	Yield[1]	Cost[2]
			(inch)		(%)	(bu/A)	($/A)
1. Canopy	(EPP)	1/2X		- 7	86	62	12.06
2. Canopy	(EPP)	1/2X		-7			
	(POST)	1/4X	1.25	52	93	61	22.09
3. Canopy	(EPP)	1/2X		-7			
	(POST)	1/2X	3.0	56	98	61	29.32
4. Squadron	(EPP)	1/2X		-7	83	62	17.00
5. Squadron	(EPP)	1/2X		-7			
	(POST)	1/4X	1.25	52	95	61	27.03
6. Squadron	(EPP)	1/2X		-7			
	(POST)	1/2X	3.0	56	98	63	34.26
7. Squadron	(EPP)	1X		-7	83	61	29.16
8. Roundup	(POST)	1X	8.0	65	95	63	37.56
LSD (0.05%)					7	NS	

[1] Abbreviations: Height = annual grass height, DAP = days after planting, An. Gr. = annual grass (giant foxtail and barnyardgrass), bu/A = bushels per acre, EPP = early pre-plant application, POST = post-emergence application, LSD = least significant difference, NS = no significant difference.

[2] Treatment cost = cost of all herbicides and additives (including burndown) and application cost at $2.00/A/application.

Summary and Notes

The annual grass pressure was light to moderate and the annual broadleaf pressure was non-existent. Canada thistle was present, which is why Basagran was used, but the thistle population was not uniform enough to rate. Treatments 1, 4, and 7 provided less than 87% control of annual grass, but yield was not significantly reduced.

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Rotation Effects on Soybean Cyst Nematode Populations

Objective

To assess the effects of rotation and soybean cultivar selection on soybean cyst nematode populations.

Cooperator:	Beck Bros.	Tillage:	No-tillage
County of Site:	Henry	Previous Crop:	1994 - Corn
Nearest Town:	Napoleon	Planting Date:	Soybeans 5/28/95
Major Soil Type:	Millgrove Loam (sandy)	Harvest Date:	Soybeans 10/12/95
Irrigation :	None		

Materials and Methods

A 3.1-acre site known to be infested with soybean cyst nematode was selected. In 1995, four soybean cyst nematode-resistant varieties (Asgrow 3134, Asgrow 3431, AgriPro 3460, Callahan 3377) and two susceptible varieties (Resnick, Asgrow 3237) were each replicated three times and randomly planted into the field. Individual plots were 15' x 500'. Soil samples were randomly collected at four-inch depths in each of the 18 plots. Samples were taken in June and September each year (1995 soybeans, 1996 corn, 1997 corn). Cyst counts were conducted by Dr. Paulette Pierson, Ohio State University Department of Plant Pathology, and reported as number of soybean cyst nematode eggs per 200 cc of soil.

Results

Average Number of Cyst Nematode Eggs/200 cc Soil

	Soybean		Corn		Corn	
	June 95	Sept 95	June 96	Sept 96	June 97	Sept 97
Asgrow 3134 – (R)	2880	213	1427	373	1120	120
Resnick - (S)	3813	9947	5093	2840	907	133
AgriPro 3460 – (R)	3827	667	1467	1053	773	120
Asgrow 3431 – (R)	2840	1840	1760	680	867	93
Callahan 3377 – (R)	2560	533	1067	307	800	107
Asgrow 3237 – (S)	3280	7840	3200	1613	813	427
LSD (0.05%)	2877	3887	2764	1865	696	203
Average Susceptible	3546	8893	4146	2226	860	280
Average Resistant	3027	813	1430	603	890	110

Summary and Notes

Soybean cyst nematode egg counts for susceptible varieties were significantly higher than resistant varieties at the end of the soybean growing season. At the end of the first year of corn, cyst counts after one susceptible variety (Resnick) were significantly higher than three resistant varieties. After two years of corn rotation, cyst counts decreased to non-critical levels for all varieties in the trial.

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Soybean Inoculant Trials

Objective

To evaluate a recently released USDA soybean inoculant.

Cooperator:	Dennis Baker
County of Site:	Darke
Nearest Town:	Greenville
Major Soil Type:	Miami
Drainage:	Subsurface
Irrigation:	No
Tillage:	No-till
Previous Crop:	Corn

Soil Test:	pH 7.3
	P 30
	K 148
Fertilizer Applied:	100# 0-46-0, 125# 0-0-60
Herbicides:	1qt. Roundup, 1/2 oz. Synchrony, Select, oil, 28% N
Plant Population:	175,000 plants/A
Variety:	Pioneer 9364
Planting Date:	May 17, 1997
Harvest Date:	Oct. 6, 1997

Materials and Methods

This was a plot done in cooperation with Bird Seed Co. to test USDA soybean innoculant. The plot was replicated four times in 30' x 1200' side-by-side strips.

Results

USDA Inoculant	42.88 bu./A
No Inoculant	41.98 bu./A

Treatment averages were not significantly different at the 0.05 (lsd 4.93 bu/A) and 0.20 (lsd 2.54 bu/A) probability levels. Coefficient of variation equaled 11.3%

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Yield Comparisons of Soybeans Treated with Rhizobium Inoculants

Objective

Determine if soybeans inoculated with rhizobium can increase yield over native rhizobium populations under three different pH levels.

Cooperator	Hoytville Branch, OARDC	Previous Crop:	Wheat
County of Site:	Wood	Herbicides:	Roundup
Nearest Town:	Custer	Plant Population:	175,000
Major Soil Type:	Hoytville	Variety:	Pioneer 9294 Roundup Ready
Drainage:	Tile	Planting Date:	6/12/97
Tillage:	No-till	Harvest Date:	9/26/97

Materials and Methods

Soybeans were established on a Hoytville soil with three different pH levels, 5.2 to 5.3, 5.8 to 6.0, and 6.4 to 6.6 in the spring of 1997. The beans were treated with humus rhizobium inoculants of either USDA brand or HiStick Brand. An untreated check was included. The inoculum treatments were replicated eight times and the pH treatments were replicated four times. Individual inoculum plots were 10′ x 40′ in size.

Results

Treatment	Yield (bu/A)
pH 5.2 to 5.3	50.3
pH 5.8 to 6.0	49.6
pH 6.4 to 6.6	49.2
USDA inoculant	48.9
HiStick inoculant	50.0
Check	50.2
LSD (p=.05) for pH treatments = 1.51 bu/A	
LSD (p=.05) for inoculant treatments = .77 bu/A	

Summary and Notes

According to the results of this trial, there were no significant differences among the pH levels on the yield of soybean variety Pioneer 9294 Roundup Ready. There were significant differences among inoculant types with the USDA inoculant yielding lower than the other inocu-

lant and the check treatment. There was no significant interaction (pH x inoculant) effect on soybean yield. The coefficient of variation (c.v.) for whole plots (pH) was 2.7% and the c.v. for split plots (inoculants) was 2.6%.

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Modified Relay Intercropping Soybean Nitrogen Evaluation

Objective

To determine if the timing of spring nitrogen application to wheat influences soybean yield in a modified relay intercropping system.

Cooperator: David Brewer
County of Site: Crawford
Nearest Town: Bucyrus
Major Soil Type: Blount
Drainage: Improved
Irrigation: None
Tillage: No-till
Previous Crop: Soybeans

Soil Test: pH 7.2
P 126 lbs/ac
K 316 lbs/ac
Fall Fertilizer: 300 lbs/ac 7-28-28 applied before planting
Herbicides: Treatment 1: 0.5 pt 2,4-D applied 4/14/97
Treatment 2: 1 pt 2,4-D applied 4/19/97
Varieties: Patterson wheat, Resnick soybeans
Planting Dates: 10/4/96 wheat, 6/20/97 soybean
Planting Rates: 120 lbs/ac wheat, 90 lbs/ac soybean
Harvest Dates: 7/21/97 wheat, 10/21/97 soybean

Materials and Methods

Top-dress nitrogen was applied to wheat at two different times. Treatment 1 was a single application of 65 lbs. of 28% N applied on 3/24/97, and treatment 2 was a split application of 65 lbs. 28% N on 3/24/97 plus 60 lbs. of 28% N applied 4/16/97. Individual plot size was 0.35 acre with four replications of each treatment.

Results

1997 Modified Relay Intercropping Soybean Yield Data (bu/a)

Treatment	Rep 1	Rep 2	Rep 3	Rep 4	Average
Single N	28.6	34.8	27.8	35.1	31.6
Split N	24.7	25.5	26.1	24.5	25.2

F value 10.25, significant at .05 level, LSD 4.87 bu/a, CV = 9.92; design was completely randomized

Continued on the next page.

MRI Soybean Yield Results (Three-Year Average)		
Year	Single N Application	Split N Application
1994	41.1	40.1
1995	28.9	25.2
1997	31.6	25.2
3-Year Average	33.9	30.2

No significant difference between three-year averages of nitrogen treatments.
1996 year not analyzed due to severe wheat winter kill. Overall average of all treatments = 32.1 bu/ac.

Summary and Notes

To address the issues of farm profitability and environmental protection, a modified relay intercropping (MRI) system has been studied. In this system, soybeans are planted into wheat at or past the heading stage of growth. A modified relay intercropping system can effectively utilize farm labor, time, and equipment, while at the same time reducing herbicide usage in the soybean crop. A descriptive study was conducted to measure the effects of variable wheat nitrogen fertilizer rates on soybean yield. The three-year soybean yield over all treatments in the MRI system average was 32.1 bushels per acre. The wheat three-year average over all treatments in the MRI system was 68.9 bushels. See the discussion under "MRI Wheat Nitrogen Research" results for a revenue analysis.

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Soybean Inoculation and Nitrogen Nutrition

Dr. Jim Beuerlein

The soybean is a legume whose seed contains 34% to 38% protein when the grain is at 13% moisture. Seed protein contains much nitrogen in compounds called amino acids which make up the protein. Typically, a bushel of soybean grain contains between 3.5 and 4.0 pounds of nitrogen, and the crop uses about 5 pounds of nitrogen to produce each bushel of grain. About half (150–200 pounds) of the nitrogen is fixed by Rhizobium bacteria found in the nodules, and the other half is removed directly from the soil.

Most soybean crops are nitrogen deficient throughout most of the growing season with the possible exception of a short period (2–3 weeks) during the late flowering–early pod-fill stage of growth. At that time, the rate of nitrogen fixation in the nodules is greater than the plants need. Very soon after a few pods have become fully expanded, seed filling starts, and the need for nitrogen increases dramatically. At the same time there is a large increase in demand for compounds produced by photosynthesis, and the plants redirect that production to the grain. This redirection often deprives the root system of energy needed for growth and even survival.

Dr. Jim Beuerlein, Department of Horticulture and Crop Science, The Ohio State University

As pods are being filled, the root system and some older leaves are often catabolized for carbohydrates and other materials. Prior to physiological maturity, the root system has been degenerated, the leaves stripped of all soluble carbohydrates and mineral nutrients, with those materials being deposited into the grain.

The most limiting input for larger yields is water. A close second factor is nitrogen supply followed by sunlight used to produce carbohydrates which are converted into protein, oil, and other seed storage compounds. Increasing the supply of any one of these three will increase yield. If all three can be increased, then grain yields increase dramatically. However, we have no control over sunlight and very limited control of water availability. Yield increases from adding nitrogen have been small and uneconomical, probably due to the demise of the root system during pod fill when the need for nitrogen is greatest. The most practical solution for this dilemma is to increase the amount of nitrogen fixed by the bacteria in the nodules. The bacteria used in the newer inoculates infect the root system more extensively and fix more nitrogen more efficiently. Some of the newer strains survive longer in the soil than older strains. More productive strains are being developed

using recently developed gene transfer technology and will enter the market in about two years. In the meantime, we should use the improved (sterile) inoculates currently available as a means of increasing profits. The sterile inoculants such as GRIP, HI-STICK, PULSAR, POWER PAK, SOW-FAST, SOY-SELECT, and CELL-TECH 2000 typically have six to 10 times more bacteria per gram than the non-sterile inoculants. In trials at the University of Guelph in Ontario, Canada, the sterile inoculants have produced about 1.3 Bu/Ac more yield than non-sterile materials.

The chart on this page presents the results of three years of inoculate evaluation in Ohio fields where inoculation would not be expected to increase yields. The test fields were in a soybean-corn rotation, had good fertility, appropriate pH values, and were very productive. For those 16 trials with three products (48 tests), the yield increase has been more than 1.5 bushels per acre. Since inoculation costs less than $2.00 per acre, seed inoculation is a very profitable activity. Most producers can expect larger yield increases than these in some of their fields. Following label instructions carefully will improve the results.

Soybean Inoculation Study, 1995–1997

1995	New USDA Humus.....+1.6
(Five Locations)	New USDA Liquid.....+1.6
Mean Yield	HiStick.....+1.6
50.1 Bu/Ac	
1996	Regular Humus.....+0.6
(Five Locations)	New USDA Humus.....+1.1
Mean Yield	New USDA Liquid.....+1.6
50.9 Bu/Ac	HiStick.....+2.4
1997	New USDA Humus.....+1.5
(Six Locations)	USDA Frozen in Furrow.....+1.0
Mean Yield	HiStick.....+1.6
52.4 Bu/Ac	Cell Tech.....+1.3

For 16 Tests Over Three Years

HiStick.....	+ 1.85 Bu/Ac
USDA Humus...	+ 1.40 Bu/Ac
USDA Liquid....	+ 1.40 Bu/Ac

Soybean inoculation increased:
Yield 1.55 Bu/ac
Profit by $10.10/Acre

Soybean Plow Down Nitrogen

Dr. Jim Beuerlein

A multi-year study was conducted to determine if soybeans planted after wheat harvest could fix enough nitrogen for a succeeding corn crop to be an economically viable activity. The positive and negative attributes of such an activity would be:

Positive

- Potentially fix up to 150 lbs. of nitrogen
- Reduced nitrogen cost
- Reduced need for nitrogen stabilizers
- Reduced nitrogen contamination of water resources
- Reduced soil compaction due to nitrogen application
- Reduced weed seed production following wheat harvest
- A potential use for 2.4 million bushels of soybean seed
- Recovery of nitrogen left in soil by the wheat crop
- Potential reduction in succeeding crop weed control cost

Negative

- Cost of soybean seed
- Cost of herbicides for weed control
- Cost of planting operation

Dr. Jim Beuerlein, Department of Horticulture and Crop Science, The Ohio State University

The research project was designed to answer several questions relative to the production and recovery of a maximum amount of nitrogen:

- What relative maturity should the soybean variety have?
- Would more vegetative or reproductive growth be more desirable?
- Should the residue be incorporated or left on the soil surface?
- Would super-nodulating varieties be superior for this purpose?

Procedure

The study was begun with the no-till seeding of six soybean varieties following wheat harvest in 1993. Maturity Groups 2, 3, 4, and 7 were represented with one of the group 4 and group 7 varieties having the super-nodulating gene. Treatments were replicated four times, and plots were large enough to permit four different tillage systems to incorporate the residue following the death of plants by freezing. Tillage systems included no-till, spring disking, fall chisel/spring disking, and fall moldboard/spring disking.

Within the study, 24 additional plots had herbicides applied but were not planted to

soybeans for the purpose of applying varying rates of nitrogen the following spring to produce a yield response curve for nitrogen rate. Corn yields from the soybean residue plots would be compared to the curve to determine how much corn yield was due to nitrogen supplied by the soybeans. The study was designed for two years and was conducted at two locations (Wood County and Union County) each year.

A soybean seeding rate of 250,000 seeds per acre was applied with a Great Plains No-Till drill 10-feet wide. Planting was planned to immediately follow harvest but was typically accomplished about two weeks after harvest due to rainfall or other reasons. Roundup was used for a burn down and was applied with appropriate residual weed-control materials. Hybrid selection and planting rate were determined by the cooperator.

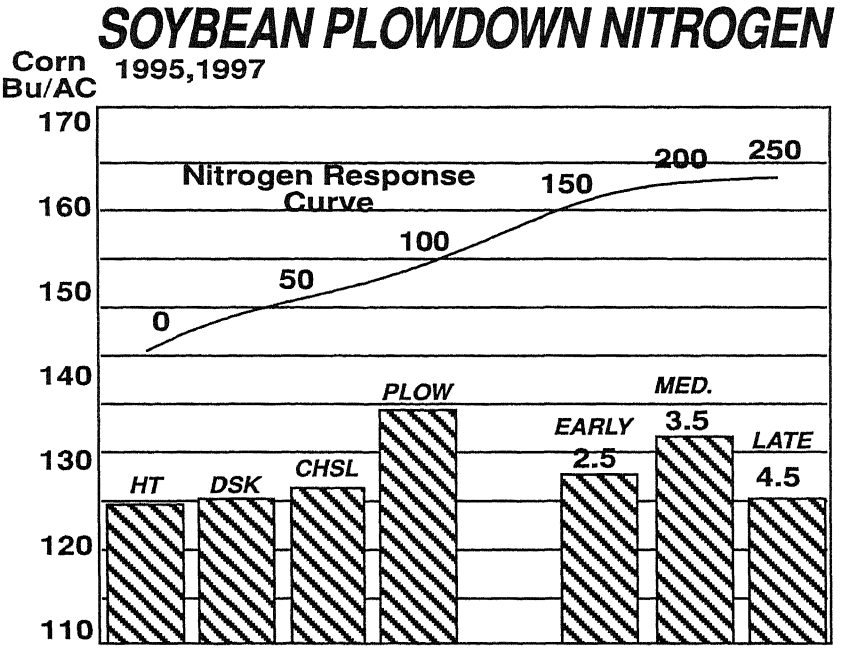
No nitrogen was applied to the research area with exception of the non-soybean residue plots which received nitrogen at rates of either 0, 50, 100, 150, 200, or 250 pounds of nitrogen per acre as a 28% nitrogen solution to develop the nitrogen response curve. Weed control for the study was accomplished with Roundup and appropriate residual materials.

Of the six attempts to collect meaningful data, only two were successful. This research program raised more questions than it answered as is often the case when attempting to create new technology. The combined results of the two data sets are shown in the accompanying chart on the next page.

Two important questions were answered (see the chart). First: For nitrogen to be recovered from this type of system, tillage will be necessary. Second: Soybean varieties should be of appropriate maturity to be actively filling pods when they are killed. The rate of nitrogen fixation is greatest when the plants are producing protein and depositing it in grain. Both results agree with known biological principles.

Unfortunately, there were not enough observations to determine the amount of nitrogen that can be fixed by this system. Another unknown is what percent of the fixed nitrogen could be recovered the following year by corn and how much would be left for the second following crop. Additional research of this nature should be conducted on soil with lower nitrogen supplying capacities to make the results more definitive and more easily interpreted. If more research is to be conducted on this topic, then the number of treatments can be reduced to those where the soybean variety would be near physiological maturity when killed. The amount of tillage needed for residue incorporation should be refined.

We wish to thank the Ohio Soybean Council for their support of this project.


SOYBEAN PLOWDOWN NITROGEN
Corn Bu/AC
1995,1997
170
160
150
140
130
120
110
Nitrogen Response Curve
0
50
100
150
200
250
HT
DSK
CHSL
PLOW
EARLY
2.5
MED.
3.5
LATE
4.5

Soybean Row Spacing

Objective

To compare soybean yield performance under three different row widths.

Cooperator:	Dennis Baker	Soil Test:	pH 6.3
County of Site:	Darke		P 38
Nearest Town:	Greenville		K 157
Major Soil Type:	Patton	Fertilizer:	
Drainage:	Subsurface	4/30/97 broadcast 100# 0-46-0, 100# 0-0-60	
Irrigation:	None	Herbicide: 5/23/97 - 1 qt Roundup, 1.5 qt Squadron, 3/4 pt. Prowl	
Tillage:	No-till	Variety:	Sandusky
Previous Crop :	Corn	Planting Date:	5/16/97
		Harvest Date:	10/7/97

Materials and Methods

Soybean row width treatments included 30" rows, double-back to make 15" rows, and drilled for 7" rows.

Seeding rates: 30" — 156,000 seeds/A; 15" — 160,000 seeds/A; 7" — 180,000 seeds/A.
30" and 15" plots replicated four times in field length strips; 7" replicated two times in plots twice the width of the other row-width treatments.

Results

Row Width	Yield	Comparisons	lsd 5%	
30"	37.45 bu./A	30" vs. 15"	6.23 bu/A	No sig. difference
15"	41.14 bu./A	30" vs. 7"	7.90 bu/A	No sig. difference
7"	40.62 bu./A	15" vs. 7"	9.20 bu/A	No sig. difference

Note: Since the treatments varied in number of replications, a separate lsd is needed to compare each pairwise comparison. Coefficient of variation equaled 11.1%.

Summary and Notes

Weed control was fair and spread evenly though the experimental plots. Growing conditions were relatively dry in July and August.

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Yield Enhancement of Short-Season Soybeans

Dr. Jim Beuerlein

The reduced period of growth between emergence and pod fill for short-season varieties results in smaller plants with fewer nodes at which to set pods. Late-maturing varieties remain vegetative for a longer period before flowering and therefore produce more nodes where pods can form. This larger plant size results in greater yield potential which is only partially realized due to reduced sunlight availability later in the season when those late-maturing varieties are filling pods.

To illustrate this point, the yield of soybeans as a function of variety maturity is presented in the figure on the next page. These data were taken from the Ohio Soybean Performance Trials for 1995 through 1997 which included 17 test sites containing 1,962 observations. Because later-maturing varieties tend to produce slightly higher yields, producers have shifted to later and later varieties over the past 15 years, hoping to increase productivity.

In recent years, many producers have experienced difficulty getting soybeans harvested early enough to allow timely wheat planting. The delayed planting of wheat makes it more susceptible to both winter kill and heaving in the spring. Additionally, later planting delays wheat heading which shortens the grain fill period and reduces the yield.

Because early maturing soybeans are small, more plants per acre are needed to maintain high yields. Ohio soybean producers typically do not increase seeding rates when planting short-season varieties, and yields are lower than possible. If the yield of early-maturing varieties could be increased by 1.5 to 2.0 Bu/Ac, then they become as profitable as the later-maturing varieties.

A proposal to test that hypothesis was presented to the Ohio Soybean Council for funding in the winter of 1996. After reviewing that proposal, the Council agreed to provide funding because the potential benefits to Ohio producers would be:

- A wider harvest window so more soybean acres could be harvested at the proper moisture for higher test weights.
- Access to early cash markets may increase a farm's average soybean price.
- Wheat could be planted more timely, which would improve winter hardiness and yield.

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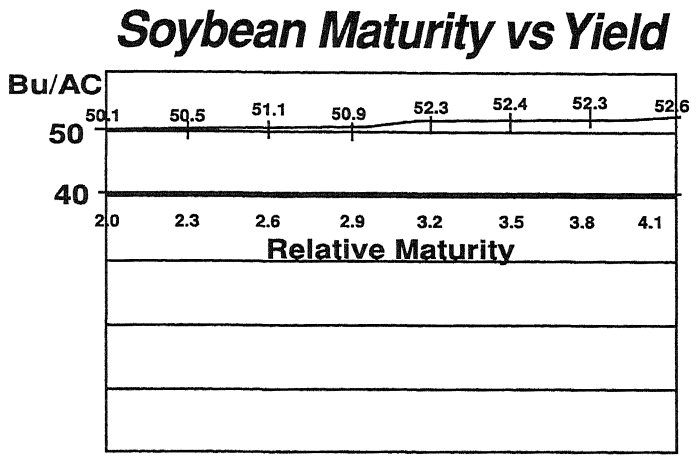

- Soybean harvest would be less rushed.
- Total farm profits should increase.

Four varieties with relative maturities of 1.5, 1.9, 2.2, and 2.5 were seeded at rates of 200,000, 250,000, and 300,000 seeds per acre on eight farms in central and northern Ohio. The study was conducted in Union, Hardin, Allen, Crawford, Henry, VanWert, and Fulton Counties. This study will be repeated in 1998 by the same cooperating farmers and their county Extension agents who helped plant, harvest, and record yield and other necessary data. The results for 1997 are presented in Table 2.

Table 2. Effect of Variety Maturity and Plant Population on the Yield of Four Soybean Varieties in 1997.

Variety Maturity	Seeding Rate Low	Med.	High	Avg.
1.5	43.6	46.3	46.3	45.4
1.9	46.7	49.1	48.8	48.2
2.1	48.1	48.7	47.7	48.2
2.5	48.8	48.8	51.1	49.6
Avg.	46.8	48.3	48.5	47.9

LSD (0.1) Variety Maturity = 2.4
LSD (0.1) Seeding Rate = 1.0
LSD (0.1) Variety x Seeding Rate = 1.6

These data indicate that increasing the seeding rate of the two earliest maturing varieties significantly increased yield (2.8 and 2.1 Bu/Ac respectively). The yield increases for the two later varieties were not statistically different. Therefore, based on eight trials, increasing the seeding rate of short-season varieties could increase their yield to near that of later-maturing varieties, allowing for an extended harvest window with no yield penalty. The earlier harvest would also allow timely wheat planting for increased winter hardiness and grain yields.

The Ohio State University Agronomy Team wishes to thank the Ohio Soybean Council for supporting this important research project.

Wheat

Wheat Seeding Rate Trial

Objective

To assess the performance of various wheat seeding rates.

Cooperator:	Dennis Baker	Soil Test:	pH 6.5
County of Site:	Darke		P 174
Nearest Town:	Greenville		K 496
Major Soil Type:	Brookston/Miami	Fertilizer:	10/2/96 - 100# 18-46-0, 100# 0-0-0
Drainage:	Subsurface		3/31/97 - 75# 46-0-0 topdress
Irrigation:	None	Herbicides:	None
Tillage:	No-till	Variety:	Shurgro 1550
Previous Crop:	Soybeans	Planting Date:	Oct. 16, 1996
		Harvest Date:	July 17

Materials and Methods

Wheat plots were planted at four seeding rates and replicated three times. Individual plots were 60 ft. wide and 550 ft. long.

Results

Seeding Rate	Yield
50 lbs/A	85.6 bu./A
75 lbs/A	86.7 bu./A
100 lbs/A	86.9 bu./A
125 lbs/A	86.1 bu./A

There were no significant differences among the treatment averages at the 0.05 (lsd 7.52 bu/A) and the 0.20 (lsd 4.42 bu/A) levels of probability. Coefficient of variation equaled 16.4%.

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Performance of White Winter Wheat Varieties

Objective

To obtain agronomic data on white wheat production in northwestern Ohio.

Cooperator:	David Brewer	Soil Test:	pH 7.0
County of Site:	Crawford		P 51 lbs/ac
Nearest Town:	Bucyrus		K 212 lbs/ac
Major Soil Type:	Blount	Fertilizer Applied:	300# 7-28-28 fall
Drainage:	Improved		65# 28%N on 3/21/97
Irrigation:	No	HerbicideProgram:	1pt MCPA on 4/28/97
Tillage:	Disked, planted	Seeding Rate:	120#/ac
Previous Crop:	Soybeans	Planting Date:	10/24/96
		Harvest Date:	7/21/97

Materials and Methods

Field was disked and fertilized prior to planting three white wheat varieties, Pioneer 2737W, Karena, and Bavaria along with a red wheat variety, Hopewell, in a completely randomized design. Individual plot size was 30′ x 540′ using four replications for each variety.

Results

Wheat Hybrid	Average Bushels/Acre
Bavaria	66.7 a
Karena	70.5 a
Hopewell	73.5 a
Pioneer 2737W	80.7 b

Wheat hybrids followed by the same letter are not significantly different at the 5% level.

Summary and Notes

The milling industry in Ohio uses white winter wheat in the production of various flour blends and cake mixes. White wheat is currently imported into the state from Michigan, Ontario, and New York to fill this demand. If winter white wheat varieties have yields comparable to red wheat varieties, this would provide an alternative crop for Ohio wheat growers.

The wheat varieties used in this trial grew uniformly and very well with virtually no diseases present. There was only a slight amount of Stagnospora present.

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Fungicide Effectiveness and Control of Wheat Head Scab

Objective

To evaluate and compare the effectiveness of two fungicides in controlling wheat head scab.

Cooperator:	University of Findlay Equestrian Farm	Soil Test:	pH	7.0
			P	41 ppm
County of Site:	Hancock		K	156 ppm
Nearest Town:	Findlay	Fertilizer:		60# top dress N
Major Soil Type:	Blount	Herbicides:		None
Drainage:	Surface-Minimal Tile	Plant Population:		120 lb per acre
Irrigation:	None	Variety:		Pioneer 2545
Tillage:	Conventional			
Previous Crop:	Alfalfa			

Materials and Methods

A study was designed to compare two fungicides and an untreated control to determine how best to control wheat head scab. The field used was an eight-acre wheat field planted October 5, 1996, which had an excellent stand. Pioneer 2545 was planted specifically since it showed the highest susceptibility to scab in the Hoytville, Ohio, 1996 tests. The field was also planted next to woods and a creek to help create more moisture for scab infection.

A 4x replicated randomized block design was used. The size of each plot was 20 ft. by 120 ft., with a 10-ft. buffer between each of the plots. The two fungicides were Benlate and Folicur, compared to an untreated control. Folicur was applied at 50% head emergence, and Benlate was applied at mid-flower. We used a 30-ft. custom-built sprayer to spray 10 ft. on each side of the plot without entering the plot. Yield data was recorded for each plot. A conventional 15-ft. combine did the harvesting. Also recorded for each plot was the percent head scab infection one month after flowering. The scab rating consisted of five counts of 20 heads per plot for a total of 100 heads per plot. Vomitoxin levels of the grain were not determined due to low levels of scab infection. Dr. Pat Lipps, plant pathologist at the Ohio Agricultural Research and Development Center's Wooster campus, assisted with the study.

Results

Treatment	Avg. Yield/Bu./Acre	Avg. % Head Scab
No Treatment	86.8	4.0
Folicur – Applied 6-5-97 @ 50% head emergence	95.9	3.8
Benlate – Applied 6-11-97 at Mid Flower	89.3	4.0
LSD (p=.05)	6.6	NS

Summary and Notes

Due to dryer weather during wheat pollination, the head scab infection was kept at a low level. However, the data shows that Folicur improved yield over the no-treatment control by 9.1 bu/acre. Benlate did not significantly improve yield as compared to the no-treatment control. The level of head scab was low in all plots, and no significant differences could be detected in the level of head scab among the treatments.

Research at other states indicates that Benlate is the better material for control of head scab. We did not see a response to Benlate. Folicur is the better material for Stagonospora leaf blotch. This leads us to conclude that the response to Folicur was due to leaf disease control and not scab control. This conclusion is supported by the fact that the wheat at harvest time was lodged quite severely, and Stagonospora leaf blotch is more severe in lodged conditions. Since this study was designed for head scab, a leaf-disease rating was not done, but more research should be completed in this area.

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Modified Relay Intercropping Wheat Nitrogen Response

Objective

To determine if the timing of spring nitrogen application to wheat influences wheat yield in a modified relay intercropping system.

Cooperator:	David Brewer	Soil Test:	pH 7.2
County of Site:	Crawford		P 126 lbs/ac
Nearest Town:	Bucyrus		K 316 lbs/ac
Major Soil Type:	Blount and Condit Bennington	Fall Fertilizer:	300 lbs/ac 7-28-28 applied before planting
Drainage:	Improved	Herbicides:	Treatment 1: 0.5 pt 2,4-D applied 4/14/97
Irrigation:	None		Treatment 2: 1 pt 2,4-D applied 4/19/97
Tillage:	No-till	Varieties:	Patterson wheat, Resnick soybeans
Previous Crop:	Soybeans	Planting Dates:	10/4/96 wheat, 6/20/97 soybean
		Planting Rates:	120 lbs/ac wheat, 90 lbs/ac soybean
		Harvest Dates:	7/21/97 wheat

Materials and Methods

Top-dress nitrogen was applied to wheat at two different times. Treatment 1 was a single application of 65 lbs. of 28% N applied on 3/24/97, and Treatment 2 was a split application of 65 lbs. 28% N on 3/24/97 plus 60 lbs. of 28% N applied 4/16/97. Individual plot size was 0.35 acre with four replications of each treatment.

Results

1997 Modified Relay Intercropping Wheat Nitrogen Evaluation

Treatment	Rep 1	Rep 2	Rep 3	Rep 4	Average
Single N	69.3	58.7	60.7	62.0	62.7
Split N	76.3	78.0	77.7	73.0	76.3

F value 27.72, significant at .05 level, LSD 6.31 bu/a, CV = 5.25; design completely randomized

Modified Relay Intercropping Wheat Yield Results (3-year average)

Year	Single N Application	Split N Application
1994	61.5	68.2
1995	71.5	73.0
1997	62.7	76.3
Three-Year Average	65.2	72.5

No significant difference between three-year averages of nitrogen treatments.
1996 year not analyzed due to severe wheat winter kill. Overall average of all treatments = 68.9 bu/ac.

Summary and Notes

Wheat yield in split-applied nitrogen plots has not been significantly different from wheat yield where only a single rate of nitrogen has been applied. However, seven bushels of wheat (average difference over three years) would easily cover the costs of a split-nitrogen application and leave $10 or more per acre as added profit in recent growing seasons. This must be balanced with the always lower soybean yield following wheat with a split nitrogen application. The research in 1998 shall be redesigned to reflect a smaller nitrogen split-nitrogen rate in an attempt to maximize wheat and soybean yield. Finally, when looking at gross revenue generated, the MRI system has been very favorable where compared to single crops of either 80-bushel wheat or 55-bushel soybeans. Using $3.50 wheat and $6.50 soybeans, the three-year average of the MRI system averaged $445 gross revenue per acre. Eighty-bushel wheat would generate $280 per acre (no straw sales), and 55-bushel soybeans would calculate to $358 per acre.

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Appendix

Soybean Inoculant Demonstration Plots

Objective

To investigate the potential benefits of the recently released USDA inoculant for soybeans.

Cooperator:	Larry Lotz	Soil Test:	pH 6.4
County of Site:	Fayette		P 121 lbs./acre
Nearest Town:	Washington C.H.		K 249 lbs./acre
Major Soil Type:	Crosby	Fertilizer:	0-69-90 (actual)
Drainage:	Improved 60 foot	Herbicides:	Roundup
Irrigation:	No	Variety:	Pioneer and Asgrow
Tillage:	Conventional-chisel plow	Planting Date:	May 7
Previous Crop:	Corn	Harvest Date:	Oct. 3

Results

Treatment	Plot No.	Plant N	Yield/Ac.	Avg. Yield	Treatment Difference
USDA Inoculant	2	6.6%	62.50 bu.	61.54 bu.	2.1 bu/ac. in
USDA Inoculant	4	6.6%	60.58 bu.		Favor of USDA
No Inoculant	1	6.8%	59.97 bu.	59.42 bu.	
No Inoculant	3	6.6%	58.88 bu.		Inoculated Plots

- Plots were planted May 7, and each measured 50′ x 400′.
- R.R. soybeans were planted, sprayed twice with Roundup, one quart each treatment. Weed control was very good.
- Infrared photo showed color difference in favor of innoculated plots.

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Soil Temperature Effects on No-Till Corn Emergence and Yield in Wheat Residue

Objective

To assess the influence of soil temperature on corn emergence and yield in wheat stubble.

Cooperator:	Larry Lotz	Soil Test:	pH 6.4
County of Site:	Fayette		P 44 lbs./acre
Nearest Town:	Washington C.H.		K 298 lbs./acre
Major Soil Type:	Crosby	Fertilizer:	220-46-120
Drainage:	Improved 60 foot	Herbicides:	Burndown (1 qt/ac Roundup and
Irrigation:	No		1 pt/ac 2,4-D) and Basis Gold
Tillage:	No-till	Variety:	DeKalb 604
Previous Crop:	Wheat		

Materials and Methods

Plots were established at three planting dates to determine the influence of soil temperature under wheat residue on the emergence of corn. Minimum and maximum soil temperatures were determined by averaging the daily soil temperatures from date of planting until emergence. Individual plot size was 30′ x 160′ with two replications.

Results

Plant Date	Date Emerged	Min. Soil Temp.	Max. Soil Temp.	Population Planted	Harvest Population	Harvest Moisture	Yield Bu/A
4/21	5/8	47.8	58.8	31,800	27,500	18.2	182
5/2	5/17	48.8	60.7	31,800	28,000	20.4	173
5/21	5/29	53.1	69.6	31,800	28,750	21.5	184

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Seeding and Nitrogen Rate Effects on Wheat Yield

Objective

To demonstrate possible effects of two seeding rates combined with two fertilizer rates on wheat yield.

Cooperator:	Dennis Baker	Soil Test:	pH 6.6
County of Site:	Darke		P 56
Nearest Town:	Greenville		K 284
Major Soil Type:	Miami	Fertilizer:	10/2/96 - 100# 18-46-0 & 100# 0-0-60
Drainage:	Subsurface		Topdress on 4/11/97 using 46-0-0
Irrigation:	None	Herbicide:	2 qt/ac Hi-Dep on 5/16/97
Tillage:	No-till	Variety:	Freedom
Previous Crop:	Soybeans	Planting Date:	10/15/96
		Harvest Date:	7/16/97

Materials and Methods

Two replications were planted using 60 lb/A and 120 lb/A seeding rates in combination with 75 lb/A and 125 lb/A nitrogen top-dress rates. Plots were harvested with like replications together.

Results

Seeding Rate	Nitrogen Rate	Yield
60 lb/A	75 lb/A	47.7 bu./A
60 lb/A	125 lb/A	56.4 bu./A
120 lb/A	125 lb/A	63.8 bu./A
120 lb/A	75 lb/A	52.9 bu./A

Summary and Notes

Nitrogen was applied in the form of urea in early April. It appears that some of the nitrogen was lost, since the lower yields were on those plots where a "normal" rate of topdress N was applied.

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