East Central and Kansas River Valley Experiment Fields

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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EAST CENTRAL KANSAS EXPERIMENT FIELD

Introduction

The research program at the East Central Kansas Experiment Field is designed to enhance the area's agronomic agriculture. Specific objectives are (1) to identify the top performing varieties and hybrids of wheat, corn, grain sorghum, and soybean; (2) to determine the amount of tillage necessary for optimum crop production; (3) to evaluate weed control practices using chemical, non-chemical, and combination methods; and (4) to test fertilizer rates and application methods for crop efficiency and environmental effects.

Soil Description

Soils on the experiment field's 160 acres are Woodson. The terrain is upland and level to gently rolling. The surface soil is a dark, gray-brown, somewhat poorly drained silt loam to silty clay loam, over slowly permeable clay subsoil. The soil is derived from old alluvium. Water-intake is slow, averaging less than 0.1 inch per hour when saturated. This makes the soil susceptible to water runoff and sheet erosion.

2006 Weather Information

Precipitation during 2006 totaled 31.73 inches, which was 5.05 inches below the 35-year average (Table 1). Rainfall during May and June was 5.38 inches below average, which affected corn yields. Rainfall during August - the critical month for soybean - was 4.76 inches above average. The coldest daily temperatures during 2006 occurred in February and December, with eight days in single digits. The overall coldest day was 4.8°F on February 18.

On 56 days during the summer of 2006, temperatures exceeded 90°F. The hottest day was July 20, with a temperature of 105°F. The hottest seven-day periods were July 14 through 20 and July 28 through August 2, when daily temperatures averaged 97.7°F and 97.5°F, respectively. The last freeze in the spring was April 9 (average, April 18) and the first killing frost in the fall was October 13 (average, October 21). The number of frost-free days was 186, compared with the long-term average of 185.

Table 1. Precipitation (inches) at the East Central Experiment Field, Ottawa, KS.

Month	2006	35-yr. avg.	Month	2006	35-yr. avg.
January	0.71	1.03	July	3.35	3.37
February	0.00	1.32	August	8.35	3.59
March	2.00	2.49	September	2.11	3.83
April	3.33	3.50	October	3.11	3.43
May	3.77	5.23	November	1.60	2.32
June	1.29	5.21	December	2.11	1.45
Annual Total				31.73	36.78

EVALUATION OF NITROGEN RATES AND STARTER-FERTILIZER PLACEMENT METHODS FOR STRIP-TILL CORN IN EASTERN KANSAS

Keith A. Janssen

Summary

Nitrogen rates and starter-fertilizer placement methods were evaluated for strip-till corn on a Woodson soil at the East Central Experiment Field in 2006. The 80 lb/a nitrogen rate for corn following soybeans maximized corn grain yields under fairly dry growing conditions. The placement of the phosphorus-potassium-nitrogen (P-K-N) starter-fertilizer beside the seed row at planting increased early-season corn growth 64 percent compared to the application of all the P-K-N starter in the strip-till zone. Increased early-season growth with planter-banded fertilizer, however, did not increase yields. Highest grain yields were produced when all of the P-K-N starter fertilizer was included in the strip-till zone.

Introduction

Corn growers in eastern Kansas might benefit if they can reduce traditional nitrogen rates when using an under-the-row strip-till banded fertilization system. Nitrogen's high cost demands prudent use. Research also considered whether there is a yield advantage from applying P-K-N starter-fertilizers beside the seed row at planting in a strip-till system. Depending on the outcome, growers may be able to adjust nitrogen rates. If there is little or no yield advantage from starter-fertilizers banded at planting versus all under-the-row, producers could avoid buying costly planter fertilizer banding equipment and not have to apply fertilizers at planting time.

Procedures

This was the first year for this study. Six nitrogen rates and three P-K-N starter-fertilizer placement methods were evaluated for corn on a Woodson silt loam soil at the East Central Kansas Experiment Field near Ottawa. Nitrogen rates compared in 2006 were 60, 80, 100, 120, 140 and 160 lb/a, including a check. The P-K-N starter-fertilizer placement methods evaluated were all applied 5 inches below the row during the strip-till operation, placed 2.5 x 2.5 inches from the seed row at planting, and a combination of half in the strip-till zone and half at planting. In all cases 30 lb/a N was applied, along with the P-K starter-fertilizers. Past research has shown that for best P response, a 1:1 N-P ratio mix should be used.

The experiment design was a randomized complete block with four replications. The previous crop was soybean. For pre-plant weed control, 1 qt/a atrazine 4L plus 0.66 pt/a 2,4-D LVE plus 1 qt/a COC were applied. Pioneer 35P17 corn was planted April 6, 2006. The P-K-N starter-fertilizers were applied 2.5 x 2.5 inches from the seed row at planting. Seed-drop was 24,500 seeds/a. Pre-emergence herbicides containing 0.5 qt/a atrazine 4L plus 1.33 pt/a Dual II Magnum were applied the day after planting. The effects of treatments on plant establishment were measured by counting all plants in the center two rows of each plot. Whole above-ground plant tissue samples (six randomly selected corn plants from non-harvest rows in each plot) were collected at the 6-leaf growth stage to measure treatment effects on early-season corn growth. Grain yields were measured by machine-harvesting the center two rows of each 10-ft-wide x 40-ft-long plot. Test plots were harvested September 1, 2006.

Results

The 2006 corn growing season was hotter and drier than normal. Under these conditions and with corn following soybeans, the 80 lb/a N rate maximized corn grain yields (Table 2). The location of starter-fertilizer significantly affected early-season corn growth (Figure 1). The application of P-K-N starter fertilizer 2.5 inches beside and 2.5 inches below the seed row at planting increased early-season corn growth by 64 percent compared to the application of all of the P-K-N starter in the strip-till zone. The combination starter applications (half at planting and half in the strip-till zone) produced intermediate early-season growth effects. The increased early-season growth with the P-K-N fertilizer banded at planting, however, did not improve grain yields (Figure 2). Highest corn grain yields were produced when all of the P-K-N starter fertilizer was applied in the strip-till zone. More years of testing are needed to determine whether this is an actual representation of how the strip-till tillage fertilization system really works or just a reflection of the growth response of corn to this particular year's moisture pattern.

Plant populations were not affected by the application of starter-fertilizers or the rates of nitrogen (Table 2).

Table 2. Effects of nitrogen rates and P-K-N starter fertilizer placement methods on plant population, V6 plant dry weight, and grain yield of strip-till corn, East Central Kansas Experiment Field, Ottawa, KS, 2006.

Fertilizer Treatments		Plant Population	V6 Dry Weight	Grain Yield
Strip-till	Planter 2.5"x2.5"			
--------------- N-P-K, lb/a ---------------		x 1000	grams/plant	bu/a
Check 0-0-0		24.3	2.1	47
60-40-20		24.3	5.5	101
80-40-20		24.8	4.2	109
50	30-40-20	24.8	6.6	103
50-20-10	30-20-10	24.6	6.4	101
100-40-20		24.3	4.4	103
120-40-20		24.9	4.3	108
90	30-40-20	24.8	7.6	102
90-20-10	30-20-10	24.2	6.2	105
140-40-20		24.1	3.9	109
160-40-20		24.1	4.0	108
130	30-40-20	24.3	6.8	100
130-20-10	30-20-10	24.0	5.3	106
LSD* 0.05		NS	1.0	6

*LSD: Least significant difference.

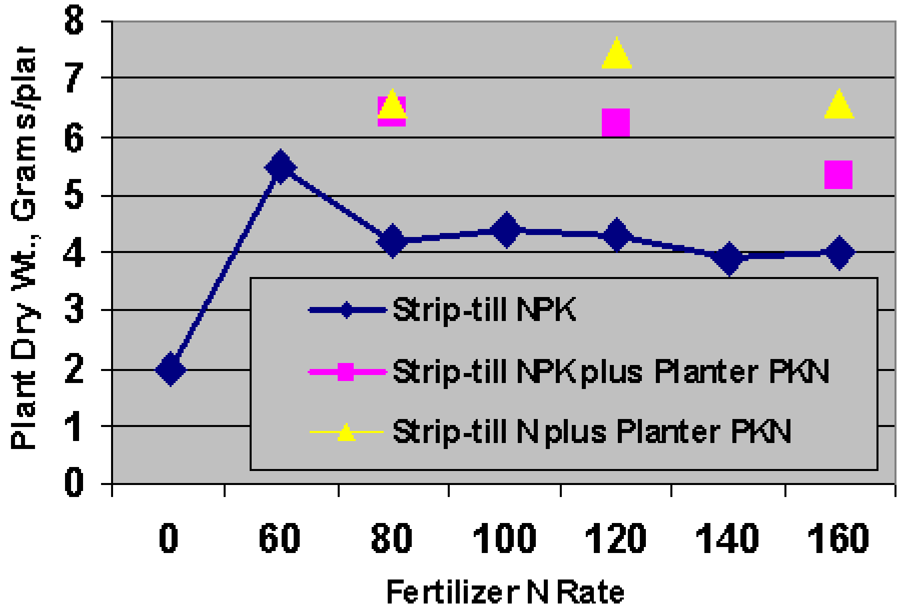

Figure 1. N rates and P-K-N fertilizer placement effects on 6-leaf growth of strip-till corn.

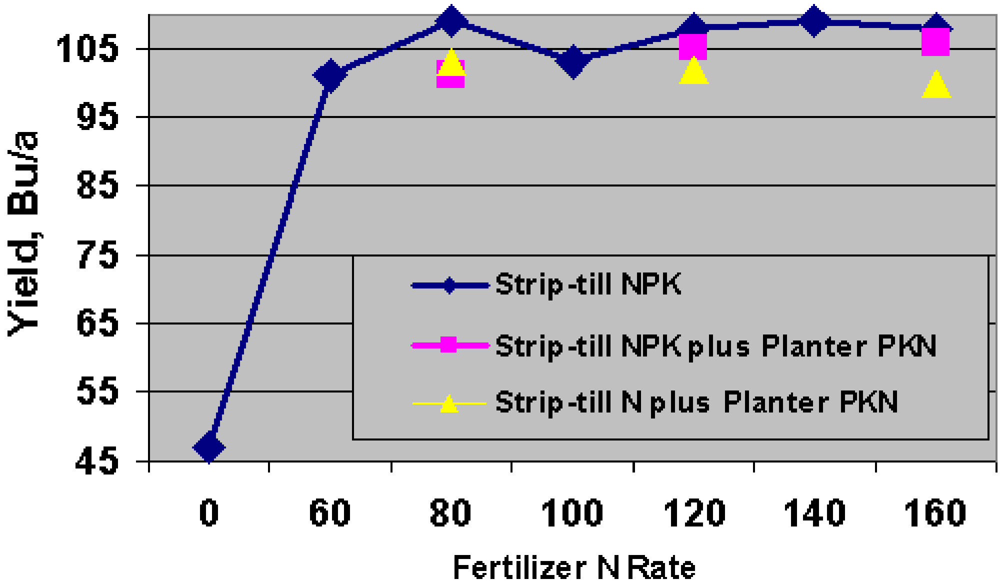

Figure 2. N rates and P-K-N fertilizer placement effects on yield of strip-till corn.

PERFORMANCE TRIALS WITH DOUBLE-CROP SOYBEANS PLANTED NO-TILL FOLLOWING WHEAT

Keith A. Janssen and Gary L. Kilgore

Introduction

Planting soybeans no-till after wheat, using Roundup Ready soybean technology for weed control, has proven to be successful for growing double-cropped soybeans in eastern Kansas. Generally, the key to successful double-crop soybeans is to plant as quickly as possible after harvesting wheat and to plant soybean varieties that will fully utilize the double-crop soybean growing season. This study evaluates group III, IV, and early group V Roundup Ready soybean varieties planted no-till after wheat.

Procedure

Five Roundup Ready soybean varieties were planted no-till in 2003, six in 2004, four in 2005, and seven in 2006. Seeding was with a no-till planter at approximately 160,000 seeds/a in 30-inch rows (9 seeds per foot of row, which is slightly more than for a full-season planting). No fertilizer was applied, but phosphorus (P) and potassium (K) soil test levels were good, and the previous wheat crops had all received P and K fertilizers. Roundup Weather Max at 22 oz/a was sprayed one or two times all years, to control weeds and volunteer wheat. Soybean planting and harvest dates, plant and pod heights, and dates when the varieties matured (pods were dry) are shown in data tables.

Results

Yields for individual varieties ranged from 17.2 to 44.4 bu/a during the four-year period (Tables 3, 4, 5, 6). Moisture was the predominant factor limiting double-crop-soybean yields in 2003, wet soil and delayed planting was a problem in 2004, near ideal growing conditions occurred in 2005, and growing conditions in 2006 were generally good. The varieties that performed best overall tended to be the longer-season varieties.

Table 3. No-till double-crop soybean variety performance test, Ottawa, KS, 2003.

Variety	Yield	Maturity	Plant Height	Pod Height
	bu/a @ 13%	month/day	inch	inch
Syngenta S40-R9	23.1	10-23	20.5	4.2
Pioneer 94B13	21.4	10-24	19.5	3.2
Pioneer 93B80	20.3	10-20	19.0	3.2
Pioneer 93B85	18.1	10-20	17.2	2.7
Stine S4442-4	17.6	10-25	17.2	2.6
LSD* 0.05	1.8	1	2.1	0.7

Planting date: July 7, 2003; harvest date: October 30, 2003.

*LSD: Least significant difference.

Table 4. Double-crop soybean variety performance test, Ottawa, KS, 2004.

Variety	Yield	Maturity	Plant Height	Pod Height
	bu/a @ 13%	month/day	inch	inch
Midland 9A432NRS	20.8	10-28	22.8	2.5
NK S40-R9	20.7	10-27	22.8	2.5
Stine 5142-4	20.3	10-28	22.8	2.8
Midland 9A485XRR	18.9	10-28	23.0	3.0
Stine 4842Y	17.4	10-30	22.0	2.8
NK S46-W8	17.2	10-29	23.0	3.0
LSD 0.05	2.8	0.9	NS	NS

Planting date: July 14, 2004 (planted into a wet seed bed); harvest date: December 14, 2004.

Table 5. Double-crop soybean variety performance test, 2005, Ottawa, KS.

Variety	Yield	Maturity	Test Weight	Plant Height	Pod Height
	bu/a @ 13%	month/day	lb/bu	inch	inch
Midland 9A462NRS	44.4	10-17	55.9	34.0	5.0
Pioneer 94M30	40.0	10-14	56.1	27.2	3.9
Midland 9A432NRS	39.2	10-12	56.0	27.5	4.2
Pioneer 93M92	35.5	10-12	56.1	26.0	3.9
LSD 0.05	6.6	-3	NS	1.9	0.6

Planting date: June 24, 2005; harvest date: October 12, 2005.

Table 6. Double-crop soybean variety performance test, 2006, Ottawa, KS.

Variety	Yield	Maturity	Test Weight	Plant Height	Pod Height
	bu/a @ 13%	month/day	lb/bu	inch	inch
Midland 4806 NRS	37.8	10-16	54.9	30.0	5.9
Pioneer 94B73	36.9	10-11	55.9	28.8	5.4
AgVenture AV 38T8NRRSTS	34.2	10-10	54.1	25.0	5.5
Midland 4367 NRR	34.1	10-12	55.1	29.2	5.4
Pioneer 94M30	34.0	10-16	55.2	27.8	5.9
Pioneer 93M95	33.2	10-8	54.6	28.5	5.8
AgVenture AV 46J5NRR	31.8	10-13	55.0	25.8	5.4
LSD 0.05	4.6	-1	0.5	1.6	NS

Planting date: June 16, 2006; harvest date: November 1, 2006.

*LSD: Least significant difference.

EVALUATION OF STRIP-TILL AND NO-TILL TILLAGE/FERTILIZATION SYSTEMS FOR GROWING GRAIN SORGHUM IN KANSAS

Keith A. Janssen and Gary L. Kilgore

Summary

Field studies were conducted at the East Central Kansas (ECK) Experiment Field at Ottawa and at an on-farm location in south-central Kansas to evaluate how strip-till will perform compared to no-till when growing grain sorghum in Kansas. Treatments at the ECK Experiment Field evaluated strip-till and no-till tillage/fertilization systems using early and traditional grain sorghum planting dates, with 0 to 150 lb/a N and selected strip-till and planter-banded starter phosphorus-potassium -nitrogen (P-K-N) fertilizer applications.

Treatments at the south-central Kansas location compared strip-till, no-till, and conventional-till tillage/fertilization systems using large replicated field plots, all at the same rate of fertilizer application. Neither location showed evidence that strip-till improved plant stands compared to no-till.

Application of fertilizer at the ECK field had a significant positive effect on early-season grain sorghum growth in both tillage systems at both planting dates. Early-season grain sorghum growth at the Sumner County location and at the ECK field were unaffected by tillage. No statistical difference in grain yields was observed because of tillage at either location. Both studies showed a clear advantage for strip-till or no-till. More years of testing are needed to fully evaluate these tillage/fertilization planting options.

Introduction

The objective of this study was to evaluate strip-till and no-till tillage/fertilization systems for grain sorghum when planted early and at regular planting dates using nitrogen rates ranging from 0 to 150 lb/a with different P-K-N starter-fertilizer application methods.

Strip-till is a conservation tillage system in which a narrow-tilled zone is produced for planting with under-the-row banded fertilizers. The study is based on the hypothesis that if grain sorghum is planted early, strip-tillage with residues moved aside and fertilizer banded under the row might benefit early-season grain sorghum growth and stand establishment. This is expected because of the warmer, loosened seed bed and a readily available source of nutrients under the row. For grain sorghum planted at the normal planting time (late May to early June), when soil temperatures are typically warmer and nutrients in the soil are generally more useable, strip-tillage in the row may not be as advantageous, and might result in reduced yields because of potentially increased moisture loss compared to no-till.

Procedures

Two studies were established in 2006: one at the ECK Experiment Field at Ottawa and one in Sumner County in south-central Kansas. The crop preceding the grain sorghum experiment at the ECK Experiment Field was no-till soybeans, and the crop preceding the grain sorghum crop at the Sumner County location was no-till grain sorghum. For pre-plant weed control at the ECK field, 1qt/a atrazine 4L plus 0.66 pt/a 2,4-D LVE plus 1 qt/a COC were applied. At the Sumner County location, 24 oz of Touchdown CF plus 17 lbs AMS and 16 oz of 2,4-D LV6 was applied for burn-down. Pioneer 84G62 grain sorghum was planted April 14 (early-planting date) and May 24 (normal time of planting) at the ECK field, and Pioneer 8500 grain sorghum was planted at the Sumner County location on May 17. Seed-drop was 52,000 seeds/a at the Sumner County location and 69,000 seed/ a at the ECK field. Preemergence herbicides containing 0.5 qt/a atrazine 4L plus 1.33 pt/a Dual II Magnum were applied at the ECK field, and 1.0 qt/a atrazine 4L plus 1.33 pt/a Dual II Magnum were applied at the Sumner county location for additional weed control.

The effects of the tillage and fertilization treatments on plant establishment were evaluated by counting or visually observing plant stands. Whole above-ground plant tissue samples (six randomly selected plants from each plot) were collected at the 6-leaf growth stage at both locations to measure treatment effects on early-season grain sorghum growth. Grain yields were measured by machine harvesting the center two rows of each 10-ft-wide by 40-ft-long plot at the ECK field and by harvesting the grain from the entire 40-ft-wide by 400-ft-long plots at the Sumner County location. Harvest was on September 5 at the Sumner County location and on September 19 at the ECK field.

Results

Moisture was limiting at both locations, but was especially short in Sumner County. At both locations and both planting dates at the ECK field there was no evidence of improved plant stands with strip-till compared to no-till (visual observation at the ECK field and plant stand counts at the Sumner County location, Table 8). Air and soil temperatures at the ECK field were unusually warm (80ºF to 90ºF air temperatures and 60ºF to 70ºF 4-inch-depth soil temperatures) during the early planting period, which could have aided plant establishment in no-till. Early season grain sorghum growth was generally unaffected by the tillage methods at either location (Tables 7 and 8). Again, this could be a reflection of unusually warm growing conditions.

Fertilizer application had a significant positive effect on early-season grain sorghum growth at both planting dates at the ECK field. On average, fertilizer increased early-season grain sorghum growth approximately 30 percent. Days to half-bloom at the ECK field ranged from 87 to 94 days after planting (July 10 through 17) for the early planted sorghum: not early enough to totally miss the main hot and dry period of the summer. Consequently, a shorter season hybrid (shorter than the 115- to 119-day hybrid that was planted) would have been more appropriate for planting early. The half-bloom dates for the later-planted sorghum occurred about 10 to 12 days after the early planted sorghum (July 22 through 28). For this later planting date, the longer season hybrid that was used was likely a good choice.

Tillage had no significant effect on days to half-boom at either location. Yields also were statistically not affected by tillage. Sixty to 90 pounds of nitrogen maximized grain sorghum yields under these fairly dry growing conditions. Split applications of starter-fertilizer, with part applied at planting and part in the strip-till zone, did not increase yields compared to all of the P-K-N starter placed below the row during the strip-till operation. Neither study showed a significant advantage for strip-till or no-till when fertilizers were banded under the row in strip-till and beside the seed row in no-till. Additional years of testing are needed to better evaluate these tillage/fertilization planting options.

Acknowledgments

We gratefully acknowledge the Kansas Grain Sorghum Commission for providing financial support for this research.

Table 7. Effects of tillage, nitrogen rates, and starter fertilizer placement on early growth, one-half bloom dates, and yield of early- and normal time-planted Pioneer 84G62 grain sorghum, ECK Experiment Field, Ottawa, KS.

Treatment		Early Planting April 14			Normal Planting May 24		
Tillage	Fertilizer Rate and Placement	6-leaf Dry-wt	½ Bloom date	Yield	6-leaf Dry-wt	½ Bloom date	Yield
		gm	July	bu/a	gm	July	bu/a
No-till	0-0-0	5.4	14	74	6.4	28	48
No-till	60-30-10, 2.5"x2.5" at planting	6.8	11	106	8.8	24	95
No-till	90-30-10, 2.5"x2.5" at planting	6.6	11	92	8.6	24	101
No-till	120-30-10, 2.5"x2.5" at planting	5.5	14	94	8.4	24	84
No-till	150-30-10, 2.5"x2.5" at planting	6.5	13	96	8.0	25	93
Mean		**6.2**	**13**	**92**	**8.0**	**25**	**84**
Strip-till	0-0-0	4.3	17	73	7.3	26	85
Strip-till	60-30-10, 5" below the row	6.0	10	93	9.4	22	107
Strip-till	90-30-10, 5" below the row	7.0	12	101	8.7	23	115
Strip-till	120-30-10, 5" below the row	6.4	11	95	8.9	22	101
Strip-till	150-30-10, 5" below the row	6.7	12	84	8.2	23	108
Mean		**6.1**	**12**	**89**	**8.5**	**23**	**103**
Strip-till	90-30-10, 5" below the row	7.0	12	101	8.7	23	115
Strip-till	60-15-5 strip-till and 30-15-5 at planting	6.6	12	83	9.2	22	107
Strip-till	120-30-10, 5" below the row	6.4	11	95	8.9	22	101
Strip-till	90-15-5 strip-till and 30-15-5 at planting	6.8	11	94	9.0	22	100
LSD* 0.05		1.1	NS	15	1.4	2	22

*LSD: Least significant difference.

Table 8. On-farm evaluation of strip-till, no-till, and conventional tillage/fertilization systems for grain sorghum in Sumner County, KS.

Treatment	Plant Population	6-leaf Plant Dry Weight	Grain Moisture	Test Weight	Yield
	x 1000	grams	%	lbs/bu	bu/a
No-till, with all of the fertilizer banded 2.5"x2.5" from the seed row at planting	28.6	4.6	13.5	56.8	41.4
Strip-till, with all of the fertilizer knifed 5" below the row	28.8	4.8	13.5	56.9	38.5
Strip-till, with 2/3 of the fertilizer knifed below the row and 1/3 fertilizer 2.5"x2.5" at planting	28.4	4.8	14.1	56.8	39.9
Conventional tillage, with all of the fertilizer knifed and then mixed with the soil by tillage	27.0	5.5	13.6	56.5	36.5
LSD. 0.05	NS	NS	NS	NS	NS

*LSD: Least significant difference.

EFFECTS OF PLANTING DATE, HYBRID MATURITY, AND PLANT POPULATION ON CORN

Larry D. Maddux

Summary

Three planting dates (March 14, March 29, and April 13), three corn hybrid maturities (98-, 106-, 112-day) and three plant populations (18,000, 22,000, 26,000 plants/a) were evaluated in 2005 near Ottawa, KS. Silking dates were the same for the first two planting dates and about 8 days later for the third. The 106- and 112-day hybrids silked 3 and 5 days after the 98-day hybrid. Grain test weight decreased slightly with the third planting date and also as hybrid maturity increased. Grain yields were not significantly different at the 5 percent level of probability, but the highest yield was obtained with the 106-day hybrid planted March 29. No significant differences with plant populations were observed.

Introduction

During the past few years corn acreage has increased in east-central Kansas. This study was designed to evaluate three planting dates, three plant populations, and three corn hybrids of varying maturities.

Procedures

Three Pioneer brand corn hybrids of different maturities were planted in 2005 on a Woodson silt loam on the East Central Experiment Field, Ottawa, KS: PI 38H66 (98-day); PI 35P80 (106-day); and PI 33B49 (112-day). The three hybrids were planted March 13, March 29, and April 13 at seeding rates of 19,800, 24,200, and 28,600 in an effort to obtain plant populations of 18,000, 22,000, and 26,000 plants/a. Fertilizer (120-30-30) was applied with a strip-till applicator before planting. Recommended herbicides were applied for weed control. Plots were harvested with a John Deere 3300 plot combine.

Results

The plant populations obtained were close to the desired populations (data not shown). Emergence of the March 14 planting date was only 3 days before that of March 29 and they reached 50 percent silking at approximately the same dates (Table 9). The third date of planting reached 50 percent silking about 8 days later. PI 35P80 silked 3 days later than PI 38H66, and PI 33B49 reached silking 2 days after that. The test weight of the April 13 planting was lower than the other two planting dates. Test weight also tended to decrease as the hybrid maturity increased. Grain yields were not significantly different at the 5 percent level of probability, although the March 29 planting date did have the highest yield, and the April 13 date had the lowest yield. No significant differences in yields between hybrids or between plant populations were observed. However, plant populations of 22,000 and 26,000 tended to yield higher at the early planting date, while the 18,000 plants/a tended to yield higher at the April 13 planting date.

Table 9. Planting date, hybrid maturity, and plant population effects on corn, Ottawa, KS, 2005.

Planting Date	Hybrid	Population	50% Silking	Test Wt.	Yield
		Plant/a	Days after June 1	lb/bu	bu/a
March 13	PI 38H66	18,000	19	58.0	92
		22,000	19	58.6	106
		26,000	19	58.2	107
March 13	PI 35P80	18,000	21	56.8	95
		22,000	21	57.2	96
		26,000	22	56.8	93
March 13	PI 33B49	18,000	23	56.7	93
		22,000	23	57.1	100
		26,000	24	57.2	103
March 29	PI 38H66	18,000	19	58.0	103
		22,000	20	58.4	110
		26,000	20	58.4	108
March 29	PI 35P80	18,000	21	57.1	104
		22,000	22	57.9	108
		26,000	22	57.5	100
March 29	PI 33B49	18,000	23	57.4	103
		22,000	23	57.2	100
		26,000	24	57.4	102
April 13	PI 38H66	18,000	27	55.5	88
		22,000	25	55.5	89
		26,000	25	55.8	91
April 13	PI 35P80	18,000	27	55.5	100
		22,000	28	55.6	93
		26,000	29	55.4	95
April 13	PI 33B49	18,000	32	55.2	92
		22,000	32	54.4	89
		26,000	33	54.7	93
Planting Date Means:					
March 14			21	57.4	98
March 29			21	57.7	104
April 13			29	55.3	92
	Hybrid Means:				
	PI 38H66		21	57.4	99
	PI 35P80		24	56.6	98
	PI 33B49		26	56.4	97
		Pop. Means:			
		18,000	24	56.7	97
		22,000	24	56.9	99
		26,000	24	56.8	99

KANSAS RIVER VALLEY EXPERIMENT FIELD

Introduction

The Kansas River Valley Experiment Field was established to study effective management and use of irrigation resources for crop production in the Kansas River Valley. The Paramore Unit consists of 80 acres 3.5 miles east of Silver Lake on US 24, then 1 mile south of Kiro, and 1.5 miles east on 17th street. The Rossville Unit consists of 80 acres located 1 mile east of Rossville or 4 miles west of Silver Lake on US 24.

Soils Description

Soils on the two fields are predominantly in the Eudora series. Small areas of soils in the Sarpy, Kimo, and Wabash series also occur. The soils are well drained, except for small areas of Kimo and Wabash soils in low areas. Soil texture varies from silt loam to sandy loam, and the soils are subject to wind erosion. Most soils are deep, but texture and surface drainage vary widely.

2006 Weather Information

The frost-free season was 189 days at both the Paramore and Rossville units (173 days average). The last spring freeze was on April 4 at both fields (average, April 21) and the first fall freeze was October 12 (average, October 11). There were 58 days above 90^{o}F. Precipitation was 8 to 9 inches below normal for the growing season (Table 1). Precipitation was below average in May and June and irrigation was started in mid-June. Severe hail lowered corn yields at Rossville. Very little sudden death syndrome was observed in soybeans. Soybean yields were lower than normal at both fields, possibly because of the extended hot weather from June through early August.

Table 1. Precipitation at the Kansas River Valley Experiment Field (inches).

Month	Rossville Unit		Paramore Unit	
	2005-2006	30-Yr. Avg.	2005-2006	30-Yr. Avg.
Oct.	2.37	0.95	3.98	0.95
Nov.	0.74	0.89	0.83	1.04
Dec.	0.71	2.42	0.86	2.46
Jan.	0.48	3.18	0.25	3.08
Feb.	0.00	4.88	0.00	4.45
Mar.	3.07	5.46	2.32	5.54
Apr.	3.51	3.67	3.39	3.59
May	1.39	3.44	2.53	3.89
June	1.41	4.64	1.21	3.81
July	3.56	2.97	2.40	3.06
Aug.	7.11	1.90	6.89	1.93
Sep.	2.34	1.24	2.54	1.43
Total	26.68	35.64	27.20	35.23

CORN HERBICIDE PERFORMANCE TEST

Larry Maddux

Summary

The study conducted at the Rossville Unit compared preemergence and two-pass herbicide applications. Excellent control of Palmer amaranth and common sunflower resulted, and only one treatment resulted in less than 90 percent control. Control of large crabgrass and ivyleaf morning glory was generally better with the two-pass applications than with a preemergence application alone. No significant difference in yield was observed between treatments.

Introduction

Chemical weed control and cultivation have been used in row crops to reduce weed competition, which can reduce yields. Timeliness of application is a major factor in determining effective weed control. Eleven herbicide treatments, including preemergence, preemergence plus postemergence, and glyphosate herbicide treatments were compared. Weeds evaluated in this test were large crabgrass (lacg), Palmer amaranth (paam), common sunflower (cosf), and ivyleaf morning glory (ilmg)

Procedures

The test was conducted at the Rossville Unit on a Eudora silt loam soil previously cropped to soybeans. It included five preemergence (PRE) treatments, six preemergence plus early or late postemergent (EP or LP), and one untreated check. One of the PRE plus EP treatments included an experimental herbicide and is not reported. The test site had a pH of 6.9 and an organic matter content of 1.1 percent. DeKalb DKC63-81RR hybrid corn was planted on April 26 at 29,600 seeds/a in 30-inch rows. Anhydrous ammonia at 150 lb/a N was applied preplant, and 120 lb/a of 10-34-0 fertilizer was banded at planting. Herbicides were broadcast in 15 gal/a with 8003XR flat fan nozzles at 17 psi. Experimental design was a randomized complete block with three replications per treatment. PRE applications were made on April 26. EP treatments were applied on June 1 to 6-leaf corn, seedling to 1-4" large crabgrass, 4-12" Palmer amaranth, 4-12" common sunflower and 1-3" ivyleaf morning glory. LP treatments were applied on June 7 to 1-3" large crabgrass, 1-5" Palmer amaranth, 3-6" common sunflower, and 1-4" ivyleaf morning glory. Populations of all four weed species were moderate to heavy, but were generally fairly light at postemergence time in plots receiving a preemergence treatment. Plots were not cultivated. Weed control ratings reported were made on July 14. The first significant rainfall after PRE herbicide application was on April 28 (1.47 inches). Plots were irrigated as needed. Harvest was on September 19 using a John Deere 3300 plot combine.

Results

Rainfall of 1.47 inches occurred four days after planting. No crop injury was observed. Excellent control of Palmer amaranth and common sunflower was obtained with all treatments (Table 2). The Hornet + Balance Pro + Surpass treatment was the only one that gave less than 90 percent control of the two. Control of large crabgrass ranged from 73 to 92 percent and control of ivyleaf morning glory ranged from 72 to 95 percent. The two-pass application treatments generally resulted in better control than the PRE only treatments. Little grain was produced on the untreated check. No significant difference in grain yield was observed among herbicide treatments.

Table 2. Effects of pre- and post-emergence herbicides on weed control and grain yield of corn, Kansas River Valley Experiment Field, Rossville, KS, 2006.

Treatment[1]	Rate, product/a	Appl Time[2]	Percent Weed Control, July 14[3]				Grain Yield, bu/a
			lacg	paam	cosf	ilmg	
Untreated check		---	0	0	0	0	32
SureStart[4] *fb*	1.75 pt/a	PRE	88	96	100	88	144
Glyphomax XRT +	24 oz/a	LP					
AMS	2.5 lb/a	LP					
Keystone *fb*	1.4 qt/a	PRE	92	94	100	85	149
Glyphomax XRT +	24 oz/a	LP					
AMS	2.5 lb/a	LP					
Keystone +	2.8 qt/a	PRE	77	100	93	72	162
Hornet	3.5 oz/a	PRE					
Lumax	3.0 qt/a	PRE	88	96	93	72	158
Hornet +	2.0 oz/a	PRE	75	88	85	73	145
Balance Pro+	0.5 oz/a	PRE					
Surpass	2.5 pt/a	PRE					
Surpass *fb*	2.5 pt/a	PRE	88	100	100	95	164
Hornet +	3.0 oz/a	EP					
Callisto +	0.75 oz/a	EP					
AAtrex Nine-O +	0.28 lb/a	EP					
COC + AMS	1% v/v + 2.5 lb/a	EP					
Keystone *fb*	2.8 qt/a	PRE	87	100	100	95	171
Hornet +	3.0 oz/a	EP					
Callisto +	0.75 oz/a	EP					
AAtrex Nine-O +	0.28 lb/a	EP					
MSO + AMS	1% v/v + 2.5 lb/a	EP					
Keystone *fb*	2.8 qt/a	PRE	90	100	100	93	147
Hornet +	3.0 oz/a	EP					
Impact +	0.19 oz/a	EP					
AAtrex Nine-O +	0.28 lb/a	EP					
MSO + AMS	1% v/v + 2.5 lb/a	EP					
Guardsman Max	2.0 qt/a	PRE	73	100	100	87	158
Distinct	4 oz/a	EP					
Bicep II Magnum	2.1qt/a	PRE	93	100	87	75	159
LSD (0.05)			10	6	10	16	29

[2] Postemergence treatments had surfactants added per label recommendations.
[2] PRE = preemergence; EP = early postemergence; MP = mid-postemergence; LP = late postemergence.
[3] lacg = large crabgrass; paam = Palmer amaranth; cosf = common sunflower; ilmg = ivyleaf morning glory.
[4] SureStart is currently not labeled for use on corn. Commercial use is expected for the 2008 season.

EFFECTS OF PREEMERGENCE HERBICIDES FOLLOWED BY GLYPHOSATE IN SOYBEANS

Larry Maddux

Summary

A study at the Rossville Unit compared preemergence herbicide treatments followed by glyphosate. Most treatments gave good to excellent control of large crabgrass, Palmer amaranth, and common sunflower. Only two treatments resulted in better than fair control of ivyleaf morning glory. There were no significant yield differences among treatments.

Introduction

Chemical weed control and cultivation have been used in row crops to reduce weed competition, which can reduce yields. Treatments in this test included an untreated check, ten preemergence applications followed by glyphosate, and one treatment of two glyphosate applications. The weeds evaluated in this test were large crabgrass (lacg), Palmer amaranth (paam), common sunflower (cosf), and ivyleaf morning glory (ilmg).

Procedures

This test was conducted on a Eudora silt loam soil previously cropped to corn. The test site had a pH of 6.9 and organic matter content of 1.1 percent. Corn stubble had been disked in the fall. No additional tillage was done before planting. A burn-down of glyphosate, 0.75 lb ae/a plus 2,4-D ester, 0.5 pt/a, was applied on May 12. There was no rainfall before planting Stine 4102-4 soybean on May 22 at 139,000 seeds/a in 30-inch rows with10-34-0 fertilizer banded at 120 lb/a. Herbicides were broadcast at 15 gal/a, with 8003XR flat fan nozzles at 17 psi. A randomized complete block design with three replications per treatment was used. Preemergence (PRE) applications were made May 22. Mid-postemergence (MP) treatments were applied June 20 to 1-4" large crabgrass; 2 - 12" Palmer amaranth; 3 - 12" common sunflower; and 1- 4" ivyleaf morning glory. Late postemergence (LP) treatments were applied June 27. Weed sizes were: large crabgrass, 1-5"; Palmer amaranth, 1-14"; common sunflower, 1-14"; and ivyleaf morning glory, 1-6". All weed populations were moderate to heavy. Plots were not cultivated. Severe hail on June 28 defoliated approximately 60 percent of the soybeans and brought a new flush of weeds. Glyphosate, 0.75 lb ae/a + AMS was applied on July 25. No injury was observed. Weed control ratings were reported July 11. Plots were irrigated as needed and were harvested October 9 using a John Deere 3300 plot combine.

Results

Because no rainfall had been received since May 8, 0.50 inch was applied by sprinkler irrigation May 27. PRE herbicides were activated 5 days after application.

No significant crop injury was observed. All herbicide treatments gave 100 percent control of common sunflower. A contributing factor was the blanket preplant application of 2,4-D ester. Control of Palmer amaranth was very good, ranging from 83 to 95 percent. Control of large crabgrass ranged from 77 to 93 percent. The low rate of python fb Glyphomax XRT control, at 77 percent, was significantly lower than most treatments. Boundary fb Touchdown Total had the second lowest large crabrass control (82 percent). Ivyleaf morning glory control was relatively poor, ranging from 53 to 85 percent. Valor and FirstRate fb glyphosate had the best ivyleaf morning glory control (82 and 85 percent). No significant differences in soybean yield were observed.

Table 3. Effects of herbicide application on weed control and grain yield of soybean, Kansas River Valley Experiment Field, Rossville, KS, 2006.

Treatment[1]	Rate, product/a	Appl Time[2]	Percent Weed Control, July 11[3]				Grain Yield, bu/a
			lacg	paam	cosf	ilmg	
Untreated check		---	0	0	0	0	16.0
Python *fb*	0.5 oz/a	PRE	77	88	100	78	48.5
Glyphomax XRT	24.0 oz/a	MP					
Python *fb*	0.8 oz/a	PRE	87	87	100	67	46.4
Glyphomax XRT	24.0 oz/a	MP					
GF-1280 *fb*	24.0 oz/a	EP	92	90	100	53	45.7
GF-1280	24.0 oz/a	LP					
FirstRate *fb*	0.3 oz/a	PRE	85	83	100	82	46.0
Glyphomax XRT	24.0 oz/a	MP					
Boundary *fb*	1.5 pt/a	PRE	82	92	100	57	47.3
Touchdown Total	24.0 oz/a	MP					
Intrro + Valor *fb*	2.0 qt/a + 1.5 oz/a	PRE	88	95	100	67	49.6
Roundup WeatherMax	22.0 oz/a	MP					
Prowl H2O + Valor *fb*	1.0 qt/a + 1.5 oz/a	PRE	90	93	100	67	46.0
Roundup WeatherMax	22.0 oz/a	MP					
Prowl H2O + Valor *fb*	1.0 qt/a + 2.0 oz/a	PRE	88	93	100	67	45.7
Roundup WeatherMax	22.0 oz/a	MP					
Prowl H2O + Valor *fb*	1.0 qt/a + 3.0 oz/a	PRE	90	93	100	78	43.9
Roundup WeatherMax	22.0 oz.a	MP					
Valor *fb*	2.5 oz/a	PRE	93	94	100	85	50.1
Roundup WeatherMax	22.0 oz/a	MP					
Dual II Magnum *fb*	1.3 pt/a	PRE	90	95	100	63	44.7
Touchdown Total	24.0 oz/a	MP					
LSD (0.05)			6	9	--	20	6.9

[1] Postemergence treatments of glyphosate had AMS added at 2.5 lb/a.
[2] PRE = preemergence (5/22); MP = Mid-postemergence (6/20); LP = Late postemergence (6/27).
[3] lacg = large crabgrass; paam = palmer amaranth; cosf = common sunflower; ilmg = ivyleaf morning glory.

FUNGICIDES ON SOYBEANS

Larry D. Maddux

Summary

Fungicides were applied to soybeans at the R3 growth stage in 2005 and 2006 at the Kansas River Valley Experiment Field. No significant yield responses were obtained in 2005. In 2006, five of the nine fungicide treatments resulted in more than 3.0 bu/a soybean yield increase over that of the untreated check.

Introduction

Fungicides have been shown to increase grain yield of soybeans when foliar diseases are present. Sometimes increased yields have been noted even when diseases were not obvious. This research was conducted to evaluate the application of several fungicides on soybeans to evaluate their effect on grain yield.

Procedures

This test was conducted on a Eudora silt loam soil previously cropped to corn. The test site had a pH of 7.1 and an organic matter content of 2.1 percent. Corn stubble was disked and chiseled in the fall, then field-cultivated in the spring. Stine 4102-4 soybeans were planted May 24, 2005, and on May 22, 2006, at 139,000 seeds/a in 30-inch rows with 10-34-0 fertilizer banded at 120 lb/a. A randomized complete block design with four replications was used. Fungicides were applied July 25, 2005, and July 29, 2006, at 20 gal/a. Plots were sprinkler-irrigated as needed. Harvest was October, 14, 2005, and October 12, 2006, with a John Deere 3300 plot combine.

Results

Results are shown in Table 4. In 2005, no significant differences were observed among any of the treatments or the check. In 2006, the fungicide treatments of Headline, Domark, Stratego, Quadris, and Headline plus Caramba increased soybean yield by 3 bu/a or more over yield of the check. But there were no significant differences in yield among fungicides. The application of Folicure, Quilt, or Laredo did not result in a significant yield increase over that of the check. The Headline plus Folicure treatment yielded 2.8 bu/a more than the check, which was not significantly greater than that of the check at the 95 percent probability level, but would have been at the 90 percent probability level.

Table 4. Effect of fungicides applied at R3 on soybean yields, Paramore Unit, Kansas River Valley Experiment Field, 2005 and 2006.

Fungicide	Rate	Yield, 2005	Yield, 2006
	0z/a	-------------------------bu/a-------------------------	
Check		68.4	44.6
Headline	6.0	66.9	48.5
Folicure	4.0	63.7	46.4
Domark	5.0	64.7	48.7
Stratego	7.0	67.8	47.9
Quilt	14.0	65.9	45.8
Laredo	7.0	68.5	45.3
Quadris	6.2	---	48.0
Headline + Folicure	4.7 + 3.1	68.7	47.4
Headline + Caramba	4.4 + 7.7	67.5	49.6
LSD* (0.05)		NS	2.9

*LSD: Least significant difference.

EFFECTS OF TILLAGE IN CORN-SOYBEAN CROPPING SEQUENCES

Larry D. Maddux

Summary

Three tillage systems (conventional till, strip-till, and no-till) were evaluated for three years under continuous corn and soybeans and a corn-soybean rotation. The data indicated that corn and soybean yields equivalent to those obtained with conventional tillage can be obtained with strip-till and no-till tillage systems as long as weed control is maintained. One of the advantages of the corn-soybean rotation appears to be the ability to control weeds better than in the monocultures.

Introduction

Decreasing tillage can improve timeliness of operations and lower production costs, especially when considering the increasing price of fuel and equipment. Strip-till has occasionally been shown to have an advantage over no-till because of the placement of fertilizer under the row and also from soil temperatures being a little warmer in the strip-tilled area at planting time. The soil also tends to dry quicker in the strip tilled area than in no-till, allowing more timely planting. The objective of this study was to evaluate conventional till, strip-till, and no-till in a continuous monoculture of corn and soybeans and in a corn-soybean rotation.

Procedures

This test was originally established in 1983 with the tillage treatments of conventional till (fall disk and chisel, spring field cultivate); reduced till (fall or spring disk); and no-till (no tillage before planting), but was cultivated and furrowed for irrigation. In the fall of 2003, the entire plot area was disked and the reduced till was changed to a spring strip-till treatment (started in spring of 2004).

Anhydrous ammonia was used as a nitrogen (N) source for all treatments. It was knifed on 30-inch centers (between where the rows would be for no-till and conventional till and the rows would be for strip-till). The N rate used was 150 lb/a N for corn following soybeans and 175 lb/a N for continuous corn. A 2x2 starter of 10 gal/a 10-34-0 was applied at planting in addition to the anhydrous ammonia. Corn hybrids planted were: April 15, 2004 - Dekalb DKC 60-19 RRBT; April 18, 2005 - Dekalb DKC 63-81 RRYG; and April 12, 2006 - Dekalb DKC 61-72 RR2. Planting rate was 29,600 seeds/a. A full rate of preemergence herbicide was used each year. In 2005, one post application of glyphosate was applied.

Soybean varieties planted were: May 7, 2004 - Croplan 3939 RR; May 6, 2005 - Stine 4102-4; and May 22, 2007 - Stine 4102-4. Planting rate was 139,000 seeds/a. As with corn, a 2x2 starter of 10 gal/a 10-34-0 was used. A preemergence herbicide was used as well as a postemergence application of glyphosate.

Plots were irrigated as needed and harvested with a John Deere 3300 plot combine.

Results

In 2004, the strip-till - and especially the no-till plots in the continuous corn plots - lacked weed control from preemergence herbicides and did not receive the needed postemergence herbicide application. Resulting grain yields were considerably lower than in the conventional tillage plots. No significant differences in grain yields of corn following soybeans was observed, although the no-till treatment was 20 bu/a lower than the conventional and strip-till.

In 2005, a post-herbicide application provided acceptable weed control, and no significant difference was observed in corn yield due to tillage treatment. The no-till continuous corn yielded lower than the other two treatments in 2006. Corn following soybeans yielded higher than continuous corn all three years, although the difference in 2005 was not significant at the 5 percent level of probability.

Soybean yields were lower in continuous soybeans than in the corn/soybean rotation all three years, although that difference was significant at only the 10% level of probability. No significant differences between tillage systems were observed.

The data from this study would indicate that corn and soybean yields equivalent to those obtained with conventional tillage can be reached with strip-till and no-till tillage systems as long as weed control is maintained. One of the advantages of the corn-soybean rotation is the ability to control weeds better than in the monocultures.

Table 5. Effect of tillage on corn and soybeans, Kansas River Valley Experiment Field, 2004 - 2006.

Cropping		Corn, bu/a			Soybeans, bu/a		
Sequence	Tillage	2004	2005	2006	2004	2005	2006
Cont.	Conv.	231	224	195	50.1	49.7	41.4
Cont.	Strip-Till	180	216	190	42.0	48.4	35.4
Cont.	NoTill	137	216	167	49.3	54.3	34.6
Corn/SB	Conv.	226	208	203	64.4	48.9	43.7
Corn/SB	Strip-Till	228	227	242	64.9	63.8	46.7
Corn/SB	NoTill	206	233	225	67.4	60.7	44.7
LSD (0.05) (Interaction)		33	20	12	9.2	NS*	3.5
Cropping Sequence							
Cont.		183	219	185	47.1	50.8	37.2
Corn/SB		220	223	223	65.5	57.8	45.1
LSD (0.05)		10	NS	15	NS	NS*	NS*
Tillage							
Conv.		228	216	199	57.2	49.3	42.6
Strip-Till		204	222	216	53.4	56.1	41.1
No-Till		172	225	197	58.4	57.5	39.7
LSD (0.05)		23	14	21	NS	NS	3.8

CHEMICAL DISCLAIMER

Trade names are used to identify products. No endorsement is intended nor is any criticism implied of similar products not mentioned. Experiments with pesticides on nonlabeled crops or target species do not imply endorsement or recommendation of nonlabeled use of pesticides by Kansas State University. All pesticides must be consistent with current use labels. Current information on weed control in Kansas is available in the *Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland,* Report of Progress 977, available from the Distribution Center, 11 Umberger Hall, Kansas State University, or via the World Wide Web at ***www.oznet.ksu.edu/library*** [type "SRP 977" in search box].

The entire *Agronomy Field Research Report* can be found online at *www.oznet.ksu.edu/library* [type "Agronomy Field Research" in search box]. The current year's report will be posted on the Web in the late fall. The full report is also available beginning the following spring on CD-ROM from any K-State Research and Extension office. The CD also includes the past four issues of *Agronomy Field Research*, all current Kansas Performance Tests; *Kansas Fertilizer Research*; *Chemical Weed Control for Field Crops, Pastures, Rangeland and Noncropland*; and related publications.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan 66506

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