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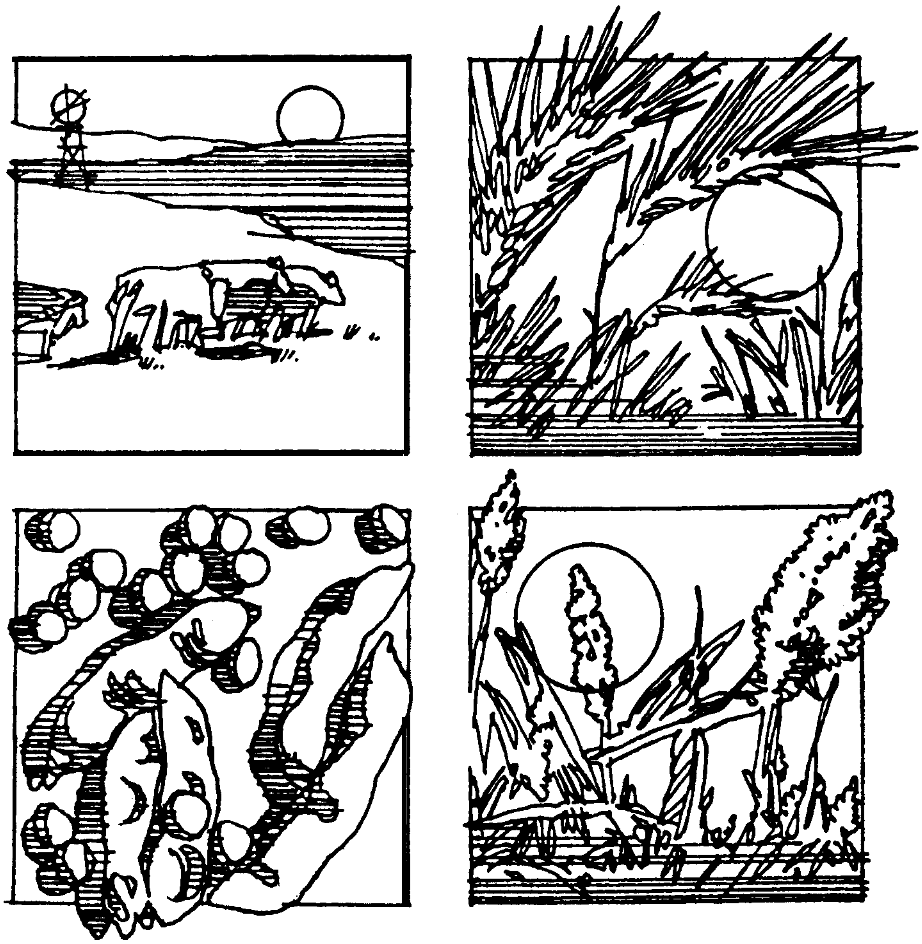

Report of Progress 786

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

SOUTHEAST AGRICULTURAL RESEARCH CENTER

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INTERSEEDING LEGUMES INTO ENDOPHYTE-INFECTED TALL FESCUE PASTURES

Lyle W. Lomas, Joseph L. Moyer, and Gary L. Kilgore[1]

Summary

A total of 90 steers grazed high-endophyte tall fescue pasture interseeded with either lespedeza, ladino clover, or red clover during 1995 and 1996. Legume cover, forage dry matter production, grazing steer performance, and subsequent feedlot performance were measured. Legume treatment caused no differences in forage availability. Lespedeza produced the greatest amount of legume cover. Although not significantly different (P>.10), steers grazing pastures interseeded with either lespedeza or ladino clover gained approximately 10% more than those grazing pastures interseeded with red clover. Feedlot performance and overall performance were similar among legume treatments.

Introduction

Cattlemen with high-endophyte tall fescue pastures can either tolerate low gains from their cattle, seek to improve animal performance by destroying existing stands of fescue and replacing them with endophyte-free fescue or other forages, or interseed legumes into existing pastures to reduce the adverse effects on animal performance.

Previous research at the Southeast Agricultural Research Center has shown that performance of stocker steers grazing high-endophyte tall fescue improved significantly when 'Regal' ladino clover was broadcast on the pastures in late winter. Lespedeza and red clover are two other legumes widely grown in southeastern Kansas. Information comparing these legumes with ladino clover interseeded in high-endophyte tall fescue in grazing situations is limited. This study was conducted to compare legume establishment, forage production, grazing performance, and subsequent feedlot performance of stocker steers grazing high-endophyte tall fescue pastures interseeded with ladino clover, lespedeza, or red clover.

Experimental Procedures

Pastures

Nine 5-acre pastures located at the Parsons Unit of the Kansas State University - Southeast Agricultural Research Center on a Parsons silt loam soil (fine, mixed thermic Mollic Albaqualf) were used in an experiment with a randomized complete block design containing three replications. The pastures of established (>5-yr) ‘Kentucky 31' tall fescue had more than 65% infection rate with the endophyte (*Acremonium coenophialum* Morgan-Jones and Gams). Pastures were fertilized in September, 1994 with 40-40-40 and in September, 1995 and 1996 with 16-40-40 lb/a of N-P_2O_5-K_2O. Pastures were treated in early spring of 1994 with 3 tons/a of ag lime (62% ECC). Three legumes were seeded in late February, 1995 with a no-till drill. Three pastures each received 4 lb/a of Regal white (ladino) clover, 12 lb/a of ‘Kenland’ red

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clover, or 15 lb/a of 'Marion' striate lespedeza. Pastures were seeded again in mid-March of 1996 with the same respective legumes that were planted in 1995 with the exception of 'Korean' rather than Marion lespedeza that was planted. Seeding rates in 1996 were 6 lb/a of Regal white (ladino) clover , 13 lb/a of Kenland red clover, or 17 lb/a of Korean lespedeza.

Available forage was determined at the initiation of grazing and during the season with a disk meter calibrated for tall fescue. Three exclosures (15-20 ft^2) were placed in each pasture to estimate total production from three readings per exclosure, and available forage was determined from three readings near each cage. Legume canopy coverage was estimated from the percentage of the disk circumference that contacted a portion of the canopy.

Grazing Steers

In 1995 and 1996, 45 mixed-breed steers were weighed on consecutive days, stratified by weight, and allotted randomly to the nine pastures. Grazing was initiated on March 31 and April 24 in 1995 and 1996, respectively. Initial weights of steers utilized in 1995 and 1996 were 690 and 524 lb, respectively. Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkye. Steers grazed for 200 and 168 days in 1995 and 1996, respectively. Steers were fed 2 lb of ground grain sorghum per head daily and had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt. Grazing was terminated by weighing the steers on October 16 and 17, 1995 and October 8 and 9, 1996.

Following the grazing period, cattle were shipped to a finishing facility and fed a diet containing 80% ground milo, 15% corn silage, and 5% supplement on a dry matter basis. Steers were implanted with Synovex-S on days 0 and 84 of the finishing period. Cattle that had grazed during 1995 and 1996 were fed a finishing diet for 164 and 139 days, respectively, and slaughtered in a commercial slaughter facility. Carcass data were collected.

Results and Discussion

Pastures

Available forage dry matter and legume coverage of the pastures for 1995 are shown in Figure 1. No interaction occurred between legume treatment and location of the readings (pasture vs. exclosure), so only pasture data are shown. Canopy coverage of legumes were generally less than 10%. Stands of legumes likely were diminished because of extremes of spring drought followed by wet soils in early summer and drought again in late summer. Coverage in red clover-seeded pastures was higher ($P<.05$) than from seeding the other legumes in March and April, but coverage was best in the lespedeza seeding by the end of June. Lespedeza coverage in cages seemed high at the end of summer, but only one pasture was high, so the variation that occurred made the means non-significant ($P>.20$). Legume treatment caused no differences in forage availability.

Available forage dry matter and legume cover for 1996 are shown in Figure 2. Cover was higher for lespedeza than for red or ladino clover. Cover for lespedeza was highest during July and August and was lowest for red clover. Legume treatment caused no difference in forage availability. However, forage availability was less in 1996 than in 1995, perhaps because of a reduction in the density of the fescue stand that occurred as a result of the extremely cold and dry winter of 1995-96.

Cattle Performance

Grazing and subsequent finishing performances of steers grazing fescue pastures interseeded with the various legumes in 1995 and 1996 are presented in Tables 1 and 2, respectively. No significant differences (P<.05) in grazing performance of steers were related to legume treatment in either 1995 or 1996. However, in both years, performance of steers grazing pastures interseeded with lespedeza or ladino clover were nearly identical and both resulted in approximately 10% higher gains than red clover. Subsequent finishing performance and overall performance were also similar among legume treatments. This study will be continued for at least three more grazing seasons, and the longevity of the various legumes will be evaluated.

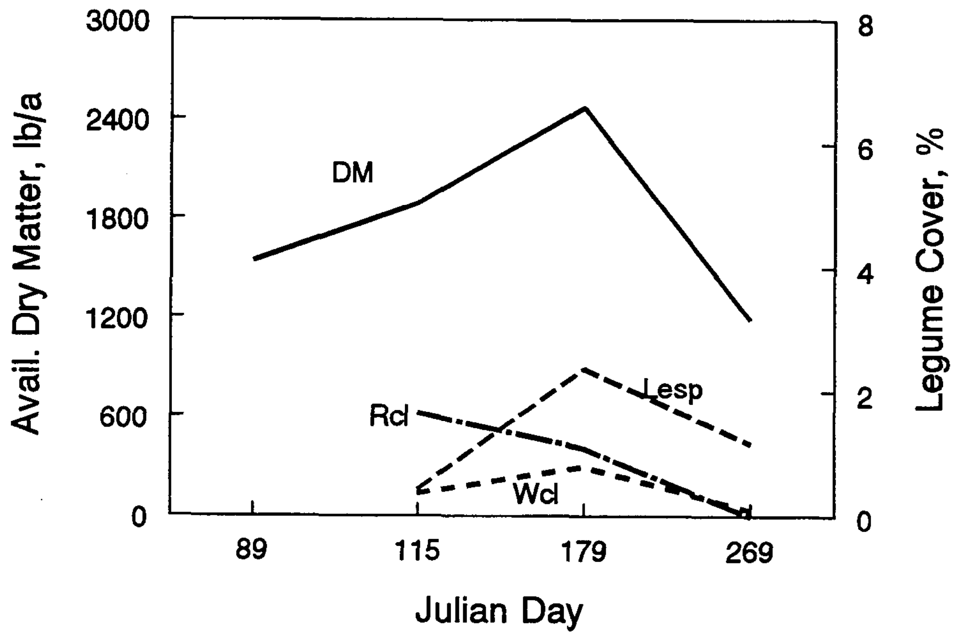

Figure 1. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1995.

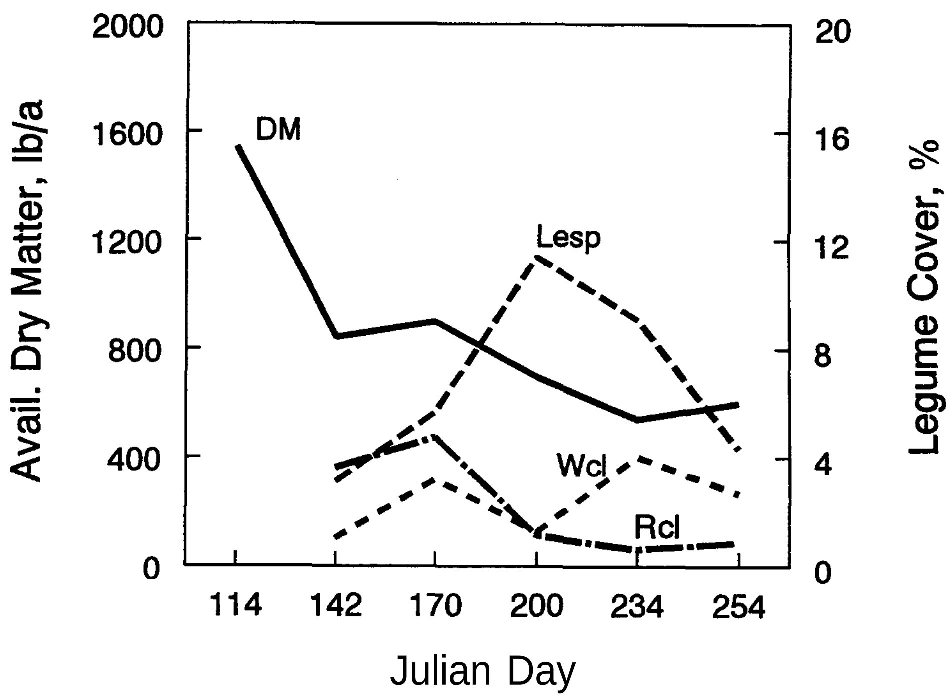

Figure 2. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1996.

Table 1. Effect of Interseeding Legumes into Endophyte-Infected Fescue Pastures on Performance of Steers in 1995, Southeast Agricultural Research Center.

Item	Legume		
	Lespedeza	Red Clover	Ladino Clover
Grazing Phase (200 Days)			
No.of head	15	15	15
Initial wt., lb	690	694	691
Ending wt., lb	926	906	924
Gain, lb	236	212	233
Daily gain, lb	1.18	1.06	1.17
Finishing Phase (164 Days)			
No. of head	15	15	15
Starting wt., lb	926	906	924
Final wt., lb	1404	1386	1367
Gain, lb	478	480	443
Daily gain, lb	2.91	2.93	2.70
Daily DM intake, lb	25.7	25.0	25.2
Feed/gain	8.9	8.6	9.4
Hot carcass wt., lb	867	862	844
Dressing %	61.8	62.1	61.7
Backfat, in	.44	.46	.49
Ribeye area, in^2	14.5	14.1	14.0
Yield grade	2.3[a,b]	2.1[b]	2.5[a]
Marbling score	SM^{63}	SM^{63}	SM^{89}
% Choice	87	80	87
Overall Daily Gain (364 Days)	1.96	1.90	1.86

[a,b]Means within a row with the same letter are not significantly different ($P < .05$).

Table 2. Effect of Interseeding Legumes into Endophyte-Infected Fescue Pastures on Performance of Steers in 1996, Southeast Agricultural Research Center.

	Legume		
Item	Lespedeza	Red Clover	Ladino Clover
Grazing Phase (168 Days)			
No.of head	15	15	15
Initial wt., lb	524	524	524
Ending wt., lb	757	733	758
Gain, lb	233	209	234
Daily gain, lb	1.39	1.24	1.39
Finishing Phase (139 Days)			
No. of head	14	15	14
Starting wt., lb	762	733	763
Final wt., lb	1223	1207	1227
Gain, lb	461	474	464
Daily gain, lb	3.31	3.41	3.34
Daily DM intake, lb	23.5	23.5	23.6
Feed/gain	7.1	6.9	7.1
Hot carcass wt., lb	756[a,b]	735[b]	761[a]
Dressing %	61.8	60.9	62.1
Backfat, in	.29	.30	.24
Ribeye area, in^2	14.9[a,b]	14.0[b]	16.2[a]
Yield grade	1.7	1.6	1.3
Marbling score	SM^{21}	SM^{03}	SL^{59}
% Choice	57	40	43
Overall Daily Gain (307 Days)	2.27	2.22	2.29

[a,b]Means within a row with the same letter are not significantly different ($P < .05$).

ALFALFA VARIETY PERFORMANCE IN SOUTHEASTERN KANSAS

Joseph L. Moyer

Summary

An alfalfa test of 18 entries seeded in 1995 was cut five times in 1996. Yields ranged from 5.14 to 5.99 tons/a. For the year, 'DK 127' yielded significantly (P<.05) less than 'Total+Z', 'Magnum IV', and 'DK 133'.

Introduction

Alfalfa can be an important feed and/or cash crop on some soils in southeastern Kansas. The worth of a particular variety is determined by many factors, including its pest resistance, adaptability, longevity under specific conditions, and productivity.

Experimental Procedures

The 18-line test was seeded (15 lb/a) on April 6, 1995 at the Mound Valley Unit. Plots were fertilized preplant and on March 20, 1996 with 0-60-200 lb/a of N-P_2O_5-K_2O. Five harvests were obtained in 1996. All entries were about half-bloom at the first cutting, 25% bloom at the second, and one-tenth bloom at the third and fourth cuttings. Alfalfa was vegetative at the fifth cutting. Moisture was short during most of the season, but dry conditions did not significantly reduce yields until the fourth cutting. Then no regrowth occurred until early-October rains provided adequate moisture (see weather summary).

Results and Discussion

Cut 1 yields were significantly (P<.05) higher from Total+Z and 'Perry' than from 'Kanza', 'WL 252HQ' or 'Riley' (Table 1). In cut 2, yield of Total+Z was higher than that of Perry and 'Innovator+Z'. In cut 3, yields of 'ABI 9141' and Magnum IV were higher than those of DK 127, Perry, and '3T26 Exp.

Total 1996 yields of Total+Z, Magnum IV, and DK 133 were higher than yield of DK 127 (Table 2). Two-year total production was greater (P<.05) from 'Total+Z', 'Supercuts', and DK 133 than from 'Riley', 'Kanza', Perry, and DK 127.

Table 1. Forage Yields of Five Cuttings in the Alfalfa Variety Test in 1996, Mound Valley Unit, Southeast Agricultural Research Center.

Source	Entry	5/23	6/18	7/16	8/16	11/12
		- - - - - - - - - - - - - -	- - tons/a	@ 12% - -	- - - - - - - - - - - - - -	
AgriPro Biosciences, Inc.	ABI 9141	2.13bc[1]	1.18abc	0.99a	0.29abc	1.10abc
AgriPro Biosciences, Inc.	Supercuts	2.26abc	1.25ab	0.86abc	0.23abc	1.06abc
AgriPro Biosciences, Inc.	ABI 9231 Exp	2.24abc	1.89abc	0.84abc	0.28abc	0.88d
AgriPro Biosciences, Inc.	Innovator + Z	2.20abc	1.09bc	0.78bc	0.22abc	0.94cd
AgriPro Biosciences, Inc.	Total + Z	2.40a	1.35a	0.88abc	0.24abc	1.12ab
AgriPro Biosciences, Inc.	ZC 9346	2.24abc	1.23ab	0.78bc	0.22abc	1.02abcd
DEKALB Plant Genetics	DK 127	2.17bc	1.12abc	0.71c	0.17c	0.98bcd
DEKALB Plant Genetics	DK 133	2.22abc	1.25ab	0.88abc	0.24abc	1.19a
Forage Genetics	3T26 Exp	2.14bc	1.18abc	0.78c	0.18bc	0.96bcd
Great Plains Research	Haygrazer	2.14bc	1.17abc	0.81abc	0.30ab	1.06abc
Mycogen Plant Sciences	TMF Generation	2.22abc	1.25ab	0.84abc	0.23abc	1.08abc
Northrup King Co.	Rushmore	2.15bc	1.23ab	0.78bc	0.23abc	1.05abc
Ohlde Seed Co.	Magnum IV	2.25abc	1.26ab	0.96ab	0.34a	1.08abc
W-L Research, Inc.	WL 252 HQ	2.09c	1.28ab	0.80abc	0.26abc	1.05abc
W-L Research, Inc.	WL 323	2.21abc	1.20abc	0.83abc	0.25abc	1.10abc
Public - Nebraska AES	Perry	2.33ab	0.98c	0.77c	0.26abc	1.04abcd
Public - Kansas AES	Kanza	2.04c	1.19abc	0.88abc	0.34a	1.10abc
Public - Kansas AES	Riley	2.10c	1.14abc	0.84abc	0.32a	0.97bcd
Average		2.20	1.20	0.83	0.26	1.04

[1]Means within a column followed by the same letter are not significantly ($P < .05$) different, according to Duncan's test.

Table 2. Total Forage Yields of the Alfalfa Variety Test, Mound Valley Unit, Southeast Agricultural Research Center.

Source	Entry	1995	1996	2-Year TOTAL
		- - - - - - - - - - tons/a (12% moisture) - - - - - - - - - -		
AgriPro Biosciences, Inc.	ABI 9141	3.74	5.68abcd[1]	9.42
AgriPro Biosciences, Inc.	Supercuts	3.94	5.66abcd	9.60
AgriPro Biosciences, Inc.	ABI 9231 Exp	3.68	5.43abcd	9.11
AgriPro Biosciences, Inc.	Innovator + Z	3.88	5.24cd	9.11
AgriPro Biosciences, Inc.	Total + Z	3.65	5.99a	9.64
AgriPro Biosciences, Inc.	ZC 9346	3.59	5.49abcd	9.08
DEKALB Plant Genetics	DK 127	3.50	5.14d	8.64
DEKALB Plant Genetics	DK 133	3.72	5.79abc	9.51
Forage Genetics	3T26 Exp	3.65	5.22cd	8.88
Great Plains Research	Haygrazer	3.25	8.73abcd	5.43
Mycogen Plant Sciences	TMF Generation	3.54	5.60abcd	9.14
Northrup King Co.	Rushmore	3.48	5.46abcd	8.94
Ohlde Seed Co.	Magnum IV	3.12	5.90ab	9.01
W-L Research, Inc.	WL 252 HQ	3.47	5.48abcd	8.95
W-L Research, Inc.	WL 323	3.67	5.58abcd	9.26
Public - Nebraska AES	Perry	3.13	5.39bcd	8.52
Public - Kansas AES	Kanza	2.89	5.55abcd	8.44
Public - Kansas AES	Riley	2.91	5.37bcd	8.28
Average		3.49	5.52	9.01
LSD(.05)		0.49	NS	0.62

[1]Means within a column followed by the same letter are not significantly (P < .05) different, according to Duncan's test.

FORAGE PRODUCTION OF SMALL GRAINS INTERSEEDED INTO BERMUDAGRASS SOD OR GROWN IN MONOCULTURE

Joseph L. Moyer and Kenneth P. Coffey[2]

Summary

Bermudagrass is a productive pasture grass in summer but is dormant for much of the year. The grazing season for bermudagrass pastures can be lengthened by fall interseeding of small grains. Performance of 'Winter King' and 'Bonel' rye cultivars, 'Karl' and 'Arkan' hard winter wheat, 'Caldwell' soft winter wheat, and 'Post' barley was tested in bermudagrass sod for 3 years and in monoculture for 2 years. Early spring forage production was greater ($P < .05$) from interseeded rye cultivars than from barley. May production of barley generally compensated, such that total forage production from all small grains interseeded into sod was similar.

Introduction

Bermudagrass [*Cynodon dactylon* (L.) Pers.] is a productive forage species when intensively managed but has periods of dormancy that are particularly long in southeastern Kansas. Annual species often invade the dormant sward, but their production is sporadic and their quality short-lived. Small grain crops can be fall-established in bermudagrass sod to lengthen the grazing season, but their performance may be hampered in the bermudagrass sward compared to a monocultured system. This study was designed to compare forage production of six small grains under multiple spring cuttings when interseeded into bermudagrass sod or sown in monoculture under clean-tilled conditions.

Experimental Procedures

Plots located at the Mound Valley Unit of the KSU - Southeast Agricultural Research Center (Parsons silt loam soil) were used in an experiment with a randomized complete block design (three replications). Six small grain cultivars were interseeded (no-till) in September of 1989, 1991, and 1992 into a mowed sod of common bermudagrass. One hundred lb/a of pure, live seed of Post barley, Winter King or Bonel rye, or 90 lb/a of Karl or Arkan hard red winter wheat or Caldwell soft red winter wheat were seeded. Nitrogen (50 lb/a) was applied in early March each year; available soil P and K were maintained in the "high" test range. Monocultured plots were grown nearby in 1991 and 1992 with the same seeding and fertilization practices used for interseeded plots.

Forage was harvested with a flail cutter at 2- to 3-in. height as soon as a harvestable amount was produced (or when weather permitted in 1993), and at approximately 4-week intervals thereafter until after heading.

Results and Discussion

Total forage yield of the six small grains interseeded into bermudagrass sod was similar ($P > .10$; Table 1). However, under monocultured conditions, Post barley produced more ($P < .05$) total yield than the other five cultivars in spring, 1993 and more than three of

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the cultivars in 1992. Only Bonel rye and Caldwell wheat produced as much total forage as Post barley in 1992 under monocultured conditions.

Forage harvested before May 1 (“early” yield) in 1990 interseeded conditions was less ($P < .05$) for Post barley than for the other five cultivars (Table 2). Post barley also produced less ($P < .05$) early forage under interseeded conditions than the two rye cultivars in 1992 and 1993 and less than Karl wheat in 1992. In monoculture, early yield of Bonel rye was higher ($P < .05$) than yields of four of the other cultivars in both 1992 and 1993.

Late spring (late-May harvest) forage production was higher ($P < .05$) for Post barley than for all other cultivars except Karl wheat in 1990 interseeded plots (Table 3). Late spring forage production of interseeded plots was similar ($P > .10$) for the cultivars in 1992 and 1993. In 1993, monocultured Post barley produced more ($P < .05$) late spring forage than the other cultivars. No difference ($P > .10$) occurred among the cultivars for late-spring forage production.

A producer with established bermudagrass can obtain similar amounts of spring forage production from interseeding any of the six cultivars tested. However, the rye cultivars tended to produce forage earlier than the others. Conversely, Post barley tended to produce more late spring (May) forage than the other cultivars.

When the small grains were grown in a clean-tilled monoculture, Post barley and Bonel rye tended to produce the most total forage. Rye cultivars again tended to produce forage earlier than Post barley, but the difference was less distinct than under no-till interseeded conditions.

Table 1. Total Spring Forage Production of Small Grain Cultivars Interseeded into Bermudagrass Sod or Sowed in Monoculture under Clean-Tilled Conditions, Southeast Agricultural Research Center.

Cultivar	Interseeded 1990	Interseeded 1992	Interseeded 1993	Monoculture 1992	Monoculture 1993
	- - - - - - - - - -	tons/a @ 12% moisture			- - - - - - - - - -
Winter King rye	1.52	1.19	1.09	3.25	2.96
Bonel rye	1.51	1.17	1.23	3.84	3.38
Karl wheat	1.97	1.05	1.22	3.24	3.10
Arkan wheat	1.67	0.91	1.48	3.02	2.84
Caldwell wheat†	1.77	0.85	1.31	3.47	3.56
Post barley	1.86	7.57	1.30	3.70	4.82
LSD(.05)	NS	NS	NS	0.36	0.68

†Soft red winter wheat.

Table 2. Early Spring (< May 1) Forage Production of Small Grain Cultivars Interseeded into Bermudagrass Sod or Sowed in Monoculture under Clean-Tilled Conditions, Southeast Agricultural Research Center.

Cultivar	Interseeded 1990	Interseeded 1992	Interseeded 1993	Monoculture 1992	Monoculture 1993
	- - - - - - - - - -	tons/a @ 12% moisture			- - - - - - - - - -
Winter King rye	0.64	0.70	0.16	2.66	2.42
Bonel rye	0.63	0.71	0.16	3.30	2.55
Karl wheat	0.66	0.53	0.06	2.74	1.17
Arkan wheat	0.68	0.42	0.07	2.55	1.24
Caldwell wheat†	0.57	0.45	0.06	2.82	1.57
Post barley	0.24	0.35	0.05	3.27	1.48
LSD(.05)	0.22	0.20	0.03	0.22	0.59

†Soft red winter wheat.

Table 3. Late Spring (May) Forage Production of Small Grain Cultivars Interseeded into Bermudagrass Sod or Sowed in Monoculture under Clean-Tilled Conditions, Southeast Agricultural Research Center.

Cultivar	Interseeded 1990	Interseeded 1992	Interseeded 1993	Monoculture 1992	Monoculture 1993
	- - - - - - - - - - -	tons/a @ 12% moisture			- - - - - - - - - -
Winter King rye	0.88	0.49	0.93	0.59	0.53
Bonel rye	0.89	0.46	1.07	0.54	0.82
Karl wheat	1.31	0.52	1.16	0.50	1.93
Arkan wheat	0.99	0.49	1.41	0.47	1.59
Caldwell wheat†	1.20	0.41	1.25	0.65	1.99
Post barley	1.61	0.64	1.25	0.42	3.33
LSD(.05)	0.36	NS	NS	NS	0.38

†Soft red winter wheat.

NITROGEN RATE AND PLACEMENT EFFECTS ON EASTERN GAMAGRASS UNDER ONE-CUT AND TWO-CUT HARVEST SYSTEMS

Joseph L. Moyer and Daniel W. Sweeney

Summary

Eastern gamagrass was fertilized for 3 previous years with three nitrogen (N) rates applied by broadcast or knife placement. Hay crops were harvested in 1995 and 1996 to measure residual effects under 1-cut or 2-cut harvest systems. Forage yield increased 94% under the 1-cut system as compared to the 2-cut. Residual N from 1992-94 applications did not affect forage yield in 1996. Knifing N in 1992-94 resulted in 17% additional 1996 yield compared to previous broadcast applications.

Introduction

Eastern gamagrass [*Tripsacum dactyloides* (L.) L.] is a warm-season perennial grass native to the North American tallgrass prairie. It has relatively better forage-yield potential and quality than most other warm-season native species. Eastern gamagrass thus may respond well to more intensive management practices such as added N and more harvests. This study was established to determine the response of eastern gamagrass to N fertilizer rates and placement under a 1-cut or 2-cut harvest system. Plots were harvested in 1996 to determine residual effects of N treatments.

Experimental Procedures

Established (15-year-old) 'Pete' eastern gamagrass was not burned in 1996 but was fertilized with 54 lb P_2O_5/a and 61 lb K_2O/a. Nitrogen was not applied in 1995 because of wet conditions or in 1996 so that residual responses could be tested further. In 1992-94, N (urea-ammonium nitrate, 28% N) treatments of 45 or 90 lb/a were applied in late April to 8 x 20 ft plots by broadcast or knife (4-inch) placement. Water was used on control plots that received no N.

Plots were cut with a flail-type harvester on June 20 and August 14 from the 2-cut system and on July 10 from the 1-cut system. Yields were determined from a 3 x 20 ft strip of each plot, with a subsample taken for moisture determination.

Results and Discussion

No significant ($P < .05$) interactions were found among treatment factors for 1996 yield, so treatment means are listed in Table 1. Total forage yield was increased by 94% under the 1-cut system as compared to 2 cuts in 1996. Rates of N application in 1992-94 did not affect 1996 yields (Table 1). This was in contrast to 1995 yield increases of 12 to 23% from previous N applications.

Knifing N for the 3 years (1992-94) resulted in more than a 17% yield increase ($P < .05$) compared to previous broadcast applications (Table 1). The response occurred in the first cutting of the 2-cut system and had the same tendency ($P < .10$) in the 1-cut harvest system. In 1995, previous knife compared to broadcast applications of N resulted in a 17% yield increase in the 1-cut but not the 2-cut harvest system.

Table 1. Eastern Gamagrass Forage Yields in 1996 under Two Harvest Systems with Residual Nitrogen from Different Nitrogen Rates and Placements in 1992-1994, Southeast Agricultural Research Center.

Harvest System	Nitrogen Rate	Nitrogen Placement	Forage Yield Cut 1	Forage Yield Cut 2	Forage Yield Total
	lb/a		- - - - - tons/a (12% moisture) - - - - -		
Means, Nitrogen Placement					
1-Cut		Broadcast	2.35	-	2.35
		Knife	2.73	-	2.73
		LSD(.05)	NS	-	NS
2-Cut		Broadcast	0.83	0.37	1.20
		Knife	1.00	0.43	1.43
		LSD(.05)	0.13	NS	0.17
Overall		Broadcast			1.77
		Knife			2.08
		LSD(.05)			0.23
Means, Nitrogen Rate					
1-Cut	0		2.26	-	2.26
	45		2.70	-	2.70
	90		2.66	-	2.66
	LSD(.05)		NS	-	NS
2-Cut	0		0.85	0.38	1.23
	45		0.90	0.38	1.28
	90		1.00	0.43	1.43
	LSD(.05)		NS	NS	NS
Overall	0				1.74
	45				1.99
	90				2.04
	LSD(.05)				NS
Means, Harvest System					
1-Cut					2.54
2-Cut					1.31
LSD(.05)				0.23	

SMALL GRAIN - LEGUME DOUBLE-CROPPING SYSTEMS

Joseph L. Moyer and Kenneth W. Kelley

Summary

Wheat followed by double-cropped soybeans is a common rotation, but the soybeans have inconsistent yields and a high cost of production. Lespedezas can be grown after wheat for forage or seed and have a lower cost of production than soybean, but potential returns may be lower. Three wheat - legume rotations were tested for 3 years. Yields averaged just under 11 bu/a for double-cropped soybean, 2 tons/a for lespedeza hay, and 325 lb/a for lespedeza seed. Only small differences in wheat production resulted from different legume systems. Nitrogen produced a positive response only in 1994 wheat production and 1995 lespedeza seed production.

Introduction

Wheat followed by double-cropped soybean is a common rotation in southeastern Kansas. Inconsistent soybean yield can be a problem, particularly considering the cost of production. Lespedezas are alternative warm-season legumes that can be grown after wheat for forage or seed. Cost of production is lower for lespedeza than soybeans, reducing the risk, but potential returns also may be lower. We have grown three wheat crops and three summer legume crops to determine (1) relative performance of crops within each system and (2) the effect of adding nitrogen to the wheat on performance of each component of the rotation.

Experimental Procedures

The area was disked each year after harvesting soybean and lespedeza seed, 'Karl 92' wheat was seeded at 75 lb/a in late November or early December in 1993-95. The area was fertilized with 30 lb/a of P_2O_5 and 40 lb/a of K_2O in February of 1994-96 and designated plots received 60 lb/a of N as urea. Lespedeza was seeded in March. Wheat was combined in June, soybean plots were disked twice, and soybeans were seeded (with 0.375 lb metribuzin and 1.5 lb alachlor preemergent). All plots were sprayed as needed with 0.28 lb a.i./a of sethoxydim. Lespedeza for hay was cut in August; lespedeza and soybean seed were harvested in November.

Results and Discussion

Wheat grain production in 1994 was not affected significantly ($P < .05$) by the legume system (Table 1). However, wheat production tended ($P < .10$) to be more after lespedeza grown for hay than after soybean. Adding 60 lb/a of N increased 1994 wheat production by 17 bu (47%). No cropping system by N rate interaction occurred.

Wheat yields were poor in 1995. Significantly more wheat was produced after lespedeza grown for seed than after a lespedeza hay crop, but the difference amounted to only 4 bu. Wheat yield after soybeans was no different than after either lespedeza crop. No effect of N and no interaction between cropping system and N rate occurred in the 1995 wheat crop.

Wheat stands and yields in 1996 were poor because of dry winter and spring conditions. Yield averaged only 12.4 bu/a and did not differ (P > .10) because of treatment.

Yields of fall crops from the different cropping systems are also shown in Table 1. Yields of lespedeza hay after small grains averaged from 1.06 to 2.75 ton/a during the 3-year period. Lespedeza hay yields were never affected by N applied to preceding wheat.

Lespedeza seed yields averaged from 88 lb/a in 1995 to more than 500 lb in 1994. Lespedeza seed yield showed a positive response of 75 lb/a in 1995 from 60 lb/a of N on the wheat. But, N application to wheat had no effect on lespedeza seed production in 1994 or 1996.

Soybean seed yields averaged 20 bu/a in 1994 but only 6 bu/a in 1994 and 1996. Nitrogen application to wheat had no significant effect on soybean yield.

Table 1. Yields from Three Wheat-Legume Cropping Systems with or without N, 1994-1996, Southeast Agricultural Research Center.

Cropping System	Harvest Phase	Wheat N Rate		Year	
			1994	1994	1996
		lb/a	- - - - - - - - - - - - bu wheat/a - - - - - - - - - - - -		
Wheat - lespedeza hay	Summer	0	44.1b[1]	10.6a	9.8a
		60	54.9c	54.9c	17.4a
Wheat - lespedeza seed		0	37.7ab	15.5ab	10.9a
		60	56.0c	16.1b	12.2a
Wheat - double-cropped soybean		0	30.8a	12.0ab	13.2a
		60	54.8c	14.6ab	10.9a
Means, Cropping Systems					
Wheat - lespedeza hay			49.5a[1]	11.5a	13.6a
Wheat - lespedeza seed			46.9a[1]	15.8b	11.6a
Wheat - double-cropped soybean			42.8A	13.3ab	12.0a
Means, Nitrogen Rate					
		0	37.5a	12.7a	11.3a
		60	55.2b	14.3a	13.5a
			- - - - - - - - - - tons lespedeza hay/a - - - - - - - - - -		
Wheat - lespedeza hay	Fall	0	2.38a	2.77a	1.04a
		60	2.01a	2.74a	1.07a
		Avg.	2.20	2.75	1.06
			- - - - - - - - - - - - lb clean seed/a - - - - - - - - - - - -		
Wheat - lespedeza seed		0	584a	50a	373a
		60	423a	125b	393a
		Avg.	504	88	383
			- - - - - - - - - - - - - bu soybean/a - - - - - - - - - - -		
Wheat - double-cropped soybean		0	20.6a	4.1a	7.2a
		60	18.9a	8.4a	5.7a
		Avg.	19.8	6.3	6.5

[1]Crop yield means within a harvest year followed by the same letter are not significantly (P < .05) different, according to Duncan's test.

USE OF A LEGUME-GRAIN SORGHUM CROPPING SYSTEM

Joseph L. Moyer and Daniel W. Sweeney

Summary

Grain sorghum was grown for 2 years with 100 lb/a or no nitrogen (N) after no clover (continuous sorghum) or red clover that was hayed (2.8 tons/a) or mulched. In Yr 1, sorghum grain production was greater after clover than after sorghum. Nitrogen (100 lb/a) increased yields uniformly by about 40%. Sorghum heads/a were increased by N fertilization, but plants/a were not affected by treatments. In Yr 2, sorghum grain yield was greater after hayed clover when sorghum received no N than with 100 lb N/a or after sorghum that received no N. Sorghum heads/a were greater after hayed clover when sorghum received no N than with 100 lb N/a and with no N after mulched clover.

Introduction

Grain sorghum is a productive feed-grain crop that is heat and drought tolerant but requires the input of N and does not maintain soil physical condition. Legume crop rotations can reduce the reliance on added N for grain sorghum production, help maintain the physical condition of the soil, or provide top growth that could be used as a livestock supplement. Red clover is suitable as a green manure crop because of its yield potential and substantial N content.

The optimum use of the legume-grain sorghum rotation in a crop-livestock system requires that several trade-offs be assessed. The legume top growth can benefit the livestock component by supplementing low-quality roughage. The objectives of this research are to determine the effects of 1) fall-seeded red clover on grain sorghum yield and quality and on selected soil properties; 2) clover removal vs. incorporation of top growth on subsequent crop and soil properties; 3) 0 or 100 lb/a of N, with or without haying, on grain sorghum characteristics; and 4) the systems on nutrient content of grain sorghum stover.

Experimental Procedures

Red clover was seeded on designated plots on March 31, 1994. Hayed plots were cut on June 16, 1995, and all plots were offset-disked on June 22. In 1995 and 1996, urea was applied at the rate of 100 lb N/a to appropriate plots, then all plots were tandem-disked two times and planted with Pioneer 8500 in June. Phosphate and potash (21 and 33 lb/a, respectively) were applied to all plots with the planter, and a preemergent application of 2 lb a.i./a of alachlor was used for weed control.

Plant samples and soil data were collected at the 9-leaf stage, the boot stage, and the soft-dough stage. At harvest, whole plants, grain, and stover samples were collected. At each sampling, dry matter production, nutrient concentrations, and forage quality are being determined.

Results and Discussion

Hayed plots produced 2.83 tons/a (12% moisture) of red clover forage in spring, 1995. Subsequent 1995 (Yr 1) grain sorghum plant stands, head count, and grain yield are listed in Table 1. Sorghum plant populations were similar in all treatments. Head counts were significantly ($P < .05$) higher after 100 lb/a of N had been applied than where no N was added, but were similar for the previous cropping treatments.

Sorghum grain yield was increased ($P < .05$) by 40% after the application of 100 lb/a of N. Yield was 5% higher after the production of red clover than after grain sorghum. No interaction occurred between clover management and N rate treatments (Table 1). Grain test weight and thousand kernel weight were similar for the treatments (data not shown).

In the second year of grain sorghum after red clover (Yr 2), plants/a and grain test weight were not affected by clover management or N rate (data not shown). Sorghum heads/a in Yr 2 were greater ($P < .05$) with no N after hayed clover than with no N after mulched clover (Table 2). Heads/a were greater after mulched clover when sorghum received no N than when it received 100 lb N/a.

Sorghum grain yield was greater ($P < .05$) with no N after hayed clover than with 100 lb N/a after hayed clover (Table 2). Continuous sorghum with no N produced lower grain yield than sorghum with no N grown after hayed clover and sorghum with 100 lb N/a grown after mulched clover. Grain test weight was similar for the treatments (data not shown).

Table 1. Grain Sorghum Plant and Head Populations and Grain Yield in Yr 1 following Red Clover (1995) as Affected by Clover Management and N Application, Southeast Agricultural Research Center.

	Population		Grain
Treatment	Plants	Heads	Yield
	- - - no./a (10^3) - - -		bu/a
Clover Management			
None	45.2	45.9	34.0
Hayed	46.6	47.2	47.9
Mulched	43.3	49.0	51.9
$LSD_{.05}$	NS	NS	9.6
Nitrogen Rate			
None	44.9	44.8	37.3
100 lb/a	45.1	49.9	51.9
$LSD_{.05}$	NS	2.8	7.8
Clover treatment X nitrogen rate interaction	NS	NS	NS

Table 2. Grain Sorghum Head Population and Grain Yield in Yr 2 following Red Clover (1996) as Affected by Clover Management and N Application, Southeast Agricultural Research Center.

Clover Management	Nitrogen Rate	Head Population	Grain Yield
	lb/a	no./a (10^3)	bu/a
None	0	36.2	58.4
	100	38.3	71.7
Hayed	0	38.8	80.7
	100	35.6	61.4
Mulched	0	34.5	67.1
	100	37.6	73.6
$LSD_{.05}$		3.2	13.6

GRAIN SORGHUM RESPONSE TO LEGUME RESIDUAL AND FERTILIZER NUTRIENTS[1]

Daniel W. Sweeney, Joseph L. Moyer, David A. Whitney[2], and Douglas J. Jardine[3]

Summary

Type of legume residual did not affect the yield of subsequent first or second grain sorghum crops; yield of the third (1996) grain sorghum crop was more following alfalfa residual than birdsfoot trefoil when no nitrogen (N) was applied but was not different when fertilized with 125 lb N/a. In 1996, greater sorghum yield increases with phosphorus (P) and potassium (K) were obtained when N also was supplied. Stalk rot severity was greater with P when no K was applied. Adding K or chloride (Cl) reduced stalk rot severity, but adding both as KCl did not result in a further reduction in visual presence of *Fusarium* stalk rot.

Introduction

With the attention recently given to sustainable agriculture, interest has been renewed in the use of legumes in cropping systems. Because sustainability of our agricultural resources needs to coincide with profitability, achieving and maintaining adequate soil fertility levels are essential. The residual from legumes such as alfalfa and birdsfoot trefoil can benefit subsequent row crops by supplying N. However, little information is available on the importance of soil P and K in the residual effects of alfalfa and birdsfoot trefoil on a subsequent grain sorghum crop.

Experimental Procedures

The experiment was established on a Parsons silt loam in spring 1994. Since 1983, different soil test levels have been maintained in whole plots by fertilizer applications to develop a range of soil P and K levels. The experimental design was a split-split-plot. The whole plots comprised a factorial arrangement of P and K rates, in addition to selected Cl comparison treatments. Phosphorus rates were 0, 40, and 80 lb P_2O_5/a, and K rates were 0, 75, and 150 lb K_2O/a. Subplots were alfalfa and birdsfoot trefoil residuals. Chloride comparison treatments involved a 2x2 factorial combination of K and Cl by using KCl, K_2SO_4, $CaCl_2$, or no K or Cl. Sub-subplots were 0 and 125 lb N/a applied as urea. Three-year-old alfalfa and birdsfoot trefoil were killed by offset disking on March 22, 1994. Grain sorghum was planted at 62,000 seeds/a in June in 1994, 1995, and 1996. Stalk rot scores (bottom 10 nodes) were taken at harvest maturity in 1995 and 1996.

[1] Research partially supported by the Kansas Fertilizer Research Fund.

[2] Department of Agronomy, KSU.

[3] Department of Plant Pathology, KSU.

Results and Discussion

Although not significant in previous years (data not shown), grain sorghum yield in 1996 was affected by an interaction between N rate and previous legume residual (Fig. 1). Without N, yield was 6 bu/a more where alfalfa had been grown during 1991-1993 than following birdsfoot trefoil. However, when 125 lb N/a were added, the difference in yield following either legume was less than 2 bu/a. Although mineralization in this atypical, high organic matter soil may partially mask legume residual effects, birdsfoot trefoil residual appears to be contributing less N to this third-year grain sorghum crop after incorporation.

Grain sorghum yield also was affected by interactions of N with P and also with K fertilization. Without added N, yield increased about 12 bu/a with 40 lb P_2O_5/a but did not increase further with 80 lb P_2O_5/a (Fig. 2). With N, the yield increase with 40 lb P_2O_5/a was 25 bu/a, with little additional yield with 80 lb P_2O_5/a. Without N, sorghum yield was about 6 bu/a more with 75 lb K_2O/a than with no K but declined to about 92 bu/a with 80 lb K_2O/a (Fig. 3). In contrast, yield increased about 10 bu/a with 75 lb K_2O/a and 125 lb N/a and tended to increase further to nearly 107 bu/a with 150 lb K_2O/a and 125 lb N/a.

Although lodging was minor (data not shown), the number of internodal spaces with visual evidence of *Fusarium* stalk rot symptoms was affected by interactions of K with N and with P fertilization. Without N, stalk rot severity neared seven nodes/plant with no K but was reduced with K fertilization (Fig. 4). With no K fertilization, stalk rot severity was less with N than without N. However, with K fertilization, little difference occurred in stalk rot severity regardless of N rate. Without P, stalk rot was evident in about five nodes/plant and did not decrease until K fertilization was increased to 150 lb K_2O/a (Fig. 5). In contrast, when P was applied with no K, more than six nodes/plant showed visual signs of *Fusarium* stalk rot. Adding K at either rate reduced the visual signs of stalk rot to less than five nodes/plant.

Because the results mentioned in the previous paragraph refer to KCl, analyses of additional treatments provided data regarding separate K and Cl effects on yield and stalk rot. Potassium as KCl or K_2SO_4 increased yields by nearly 11 bu/a and reduced stalk rot severity (data not shown). Stalk rot severity scores were affected by an interaction between K and Cl (Fig. 6). Without K or Cl, more than six nodes/plant showed visual signs of stalk rot. Adding K without Cl or adding Cl without K reduced stalk rot severity to about five nodes/plant with visual symptoms. However, adding both as KCl did not result in any further lowering of the number of nodes showing visual stalk rot.

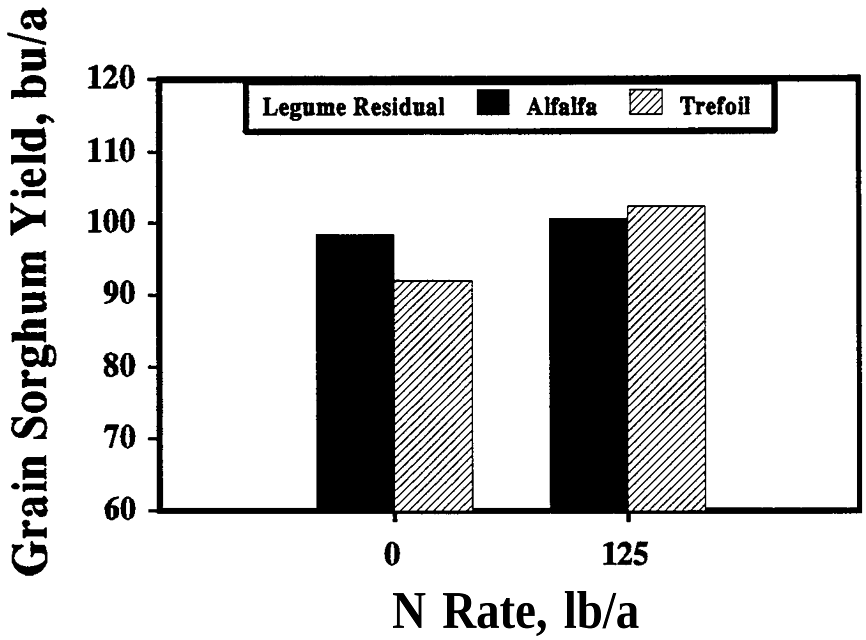

Figure 1. Effects of N Rate and Legume Residual on Grain Sorghum Yield, Southeast Agricultural Research Center, 1996.

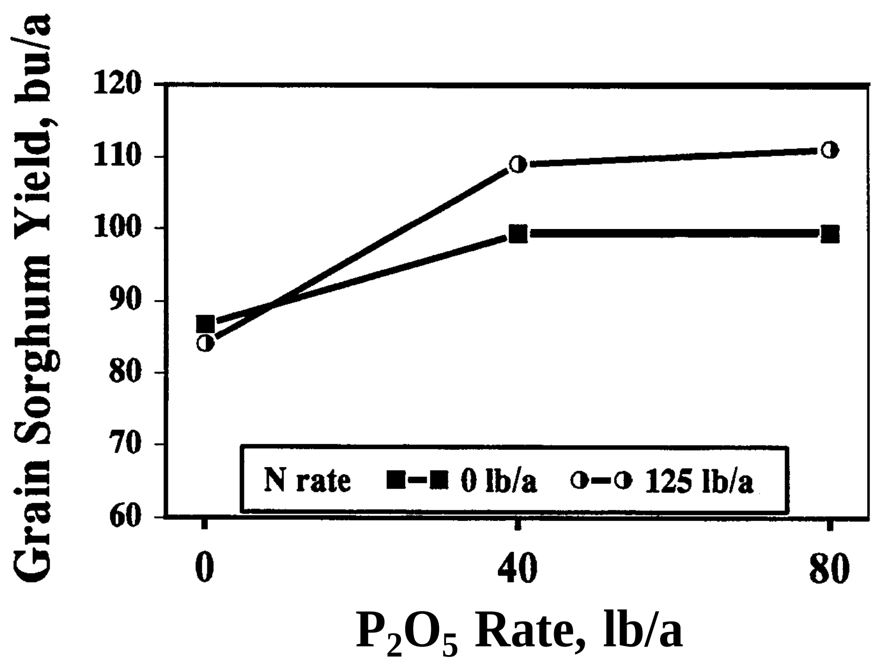

Figure 2. Effects of N and P Fertilization Rates on Grain Sorghum Yield, Southeast Agricultural Research Center, 1996.

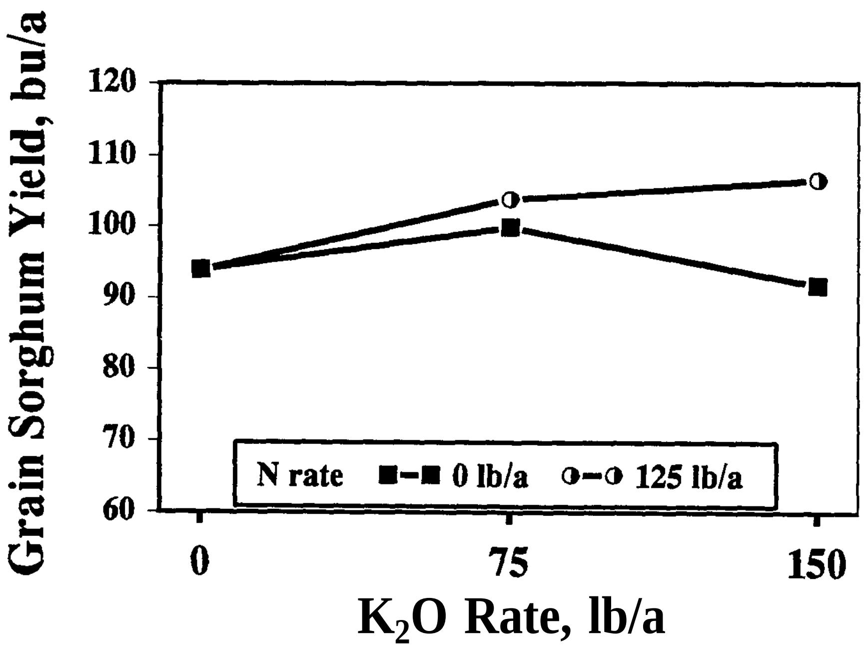

Figure 3. Effects of N and K Fertilization Rates on Grain Sorghum Yield, Southeast Agricultural Research Center, 1996.

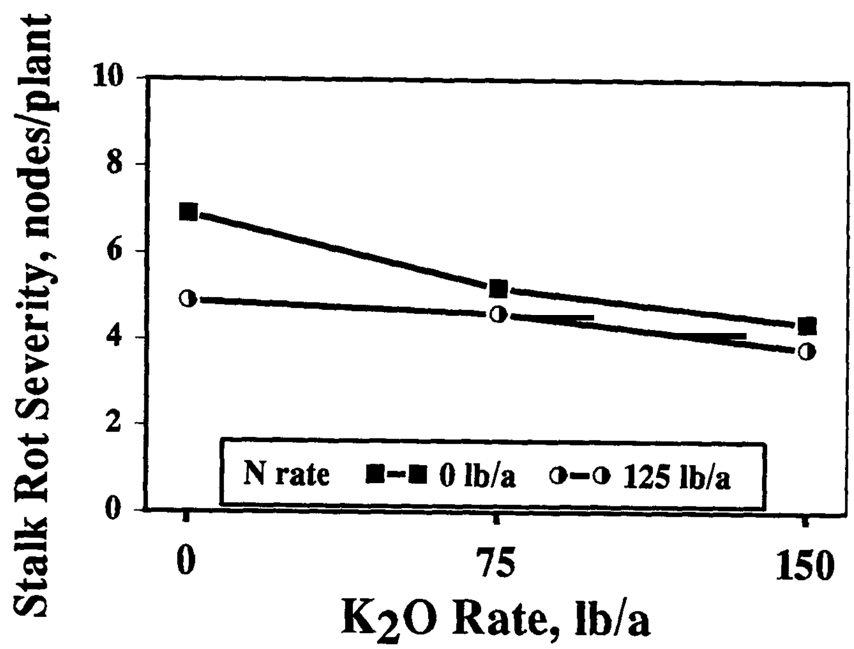

Figure 4. Effects of N and K Fertilization Rates on Stalk Rot Severity in the Bottom 10 Nodes of Grain Sorghum Plants, Southeast Agricultural Research Center, 1996.

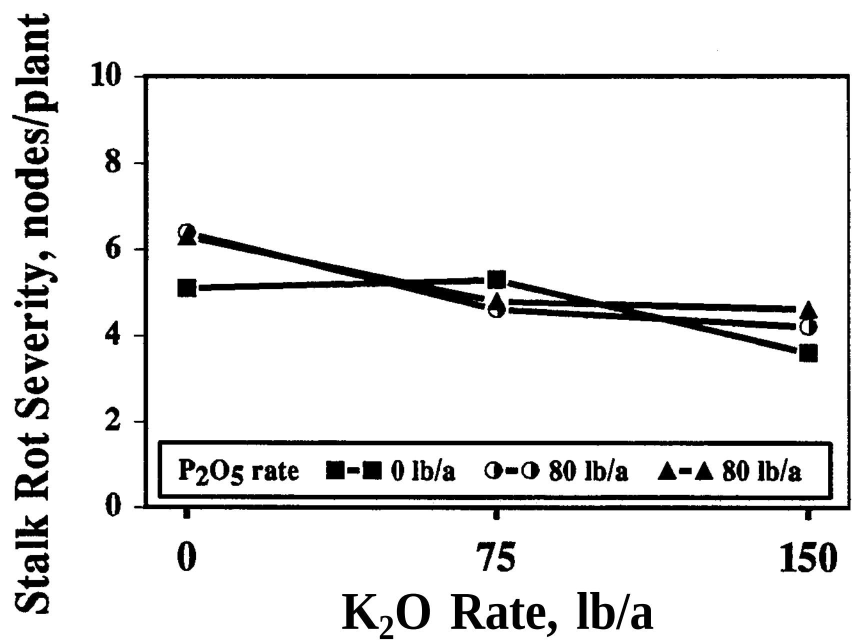

Figure 5. Effects of P and K Fertilization Rates on Stalk Rot Severity in the Bottom 10 Nodes of Grain Sorghum Plants, Southeast Agricultural Research Center, 1996.

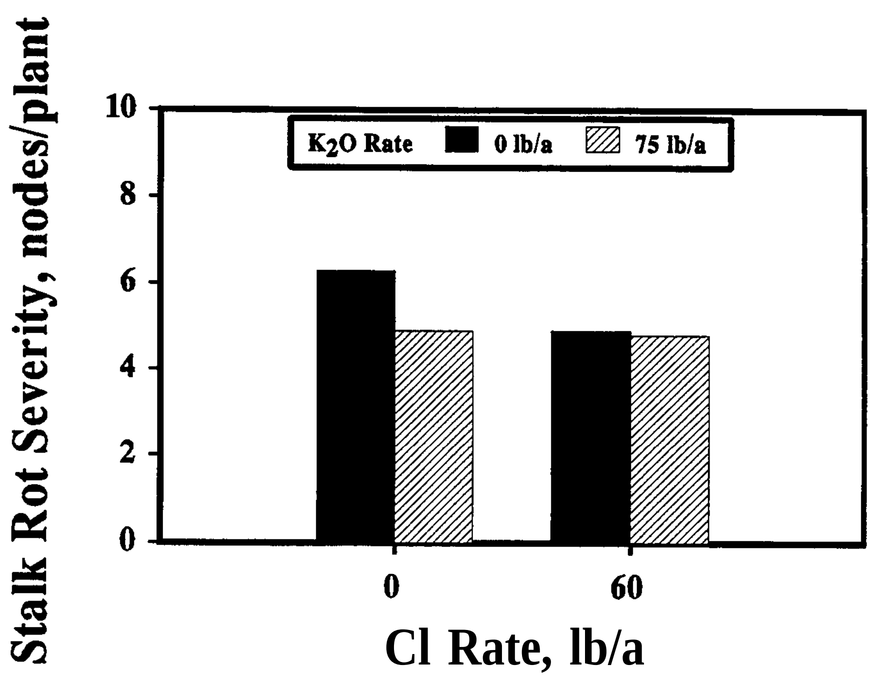

Figure 6. Effects of K and Cl Fertilization on Stalk Rot Severity in the Bottom 10 Nodes of Grain Sorghum Plants, Southeast Agricultural Research Center, 1996.

EFFECT OF TIMING OF LIMITED-AMOUNT IRRIGATION ON POPCORN GROWN AT DIFFERENT POPULATIONS

Daniel W. Sweeney and Charles W. Marr[1]

Summary

Irrigation, especially at R1, tended to increase popcorn yields. Plant population did not affect yields in 1996.

Introduction

Field corn responds to irrigation, and timing of water deficits can affect yield components. Popcorn is considered as a possible, value-added, alternative crop for producers and is being developed in western Kansas but less so in the southeastern part of the state. Literature is lacking on effects of both irrigation management and plant density on the performance of popcorn.

Experimental Procedures

The experiment was established on a Parsons silt loam in spring 1995 as a split-plot arrangement of a randomized complete block with three replications. The whole plots included six irrigation managements: i) no irrigation, ii) 1 in. at R1 (silk), iii) 2 in. at R1, iv) 1 in. at R3 (milk), v) 2 in. at R3, and vi) 1 in. at both R1 and R3. The subplots consisted of three plant densities; 15000, 20000, and 25000 plants/a. Plots were overplanted with P-410 popcorn on May 17, 1996 and thinned to the desired populations on June 18. Plots were harvested on October 8.

Results and Discussion

Overall popcorn yields were low in 1996 (Table 1). However, statistical contrasts showed that adding irrigation increased yields, especially application at R1, which resulted in yields that were more than twice those obtained with no irrigation. No statistical differences occurred between 1 in. and 2 in. of irrigation or when 2 in. were split applied between R1 and R3 compared to all 2 in. applied at one time. In 1996, plant population did not affect popcorn yield.

Table 1. Effect of Irrigation Timing and Plant Density on Popcorn Yield in 1996.

Treatment	Yield
	lb/a
Timing	
None	450
R1-1 in.	1000
R1-2 in.	1040
R3-1 in.	610
R3-2 in.	640
R1-R3-1 in. at each	1150
Plant Density (per acre)	
15,000	820
20,000	810
25,000	820

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EFFECT OF POLYASPARTATE ON FERTILIZER-USE EFFICIENCY OF NO-TILL GRAIN SORGHUM[1]

Daniel W. Sweeney and Mary B. Kirkham[2]

Summary

First-year results suggest that polyaspartate (PA) applied with the starter increased N uptake, the number of kernels/head, and grain sorghum yield. Nitrogen rate affected plant nutrient uptake as well as yield and yield components but did not interact with PA placement.

Introduction

Amisorb is a long-chain polyaspartate compound. It is not a growth regulator but rather is thought to enhance plant nutrient uptake when applied with fertilizers by promoting more root mass and root hairs. Public concerns about effects of fertilizer loss on soil and water quality emphasize the importance of improving nutrient uptake efficiency by agricultural crops. New products such as polyaspartate compounds should be tested to determine their effectiveness on improving fertilizer uptake by crops and, thus, reducing the potential of fertilizer loss that causes environmental problems.

Experimental Procedures

The experiment was established on a Parsons silt loam at the Parsons Field of the Southeast Agricultural Research Center in 1996. The experiment was a 4x4 factorial arrangement of a randomized complete block with six replications. The factors were polyaspartate (PA) application method and nitrogen (N) rates. The PA application method included no PA and PA at 2 qt/a applied with the starter, applied with the fluid N, or applied with both the starter and fluid N. The N rates were the sums of the N in the starter and in the fluid N application to give totals of 40, 80, 120, and 160 lb N/a. The starter was a mix of 13-13-13 and 0-0-60 to supply 25 lb N, 25 lb P_2O_5, and 60 lb K_2O that was applied to all treatments in the 4x4 factorial. The fluid N source was 28% N knifed at a depth of 4 inches into no-till grain sorghum residue. Two additional control plots were included in each replication: one that received 25 lb P_2O_5 as 0-46-0 and 60 lb K_2O as 0-0-60 as a starter but with no N or PA and the second that received the P and K in the starter but with PA. Grain sorghum was planted with no tillage on June 26, 1996.

Results and Discussion

Applying PA with the starter resulted in nearly 9 bu/a more grain sorghum yield than starter with no PA (Table 1). Placing PA with the fluid N or with the starter + fluid N did not significantly increase yield above that with no PA. Kernel weight and the number of heads/a were not affected by PA, but PA with the starter resulted in 12% more kernels/head than no PA.

In general, grain sorghum yield increased with increasing N rate (Table 1), although additional yield response to N rates more than 80

[1] Research partially supported by AmiLar International, Inc.

[2] Department of Agronomy, KSU.

lb/a appeared to be small. The number of heads/a and kernels/head appeared to follow a similar trend. Yield or yield components were not affected by an interaction between PA placement and N rate.

Nitrogen uptake at the soft dough stage was significantly greater with PA applied with the starter compared to no PA or PA applied with the fluid N or with both the starter and fluid N (Fig. 1). This appeared to coincide with the greater number of kernels/head and greater yield with PA applied with the starter. Perhaps the greater N in the plant reduced seed abortion in the top of the head and, thus, increased yield. However, with only 1 year of data, this is unclear. Phosphorus (P) and potassium (K) uptake were unaffected by PA placement (data not shown). Increasing N rate increased N, P, and K uptake (data not shown), but there was no interaction between N rate and PA placement.

Table 1. Effects of Polyaspartate (PA) Placement and N Rate on Yield and Yield Components of Grain Sorghum, Southeast Agricultural Research Center, 1996.

Treatment	Yield	Kernel Weight	Kernels/Head	Heads/A
PA Placement				
None	65.6	24.5	1240	51100
Starter Only	74.5	26.3	1390	51800
Fluid N	69.7	26.2	1320	51400
Starter + Fluid	67.3	26.3	1310	49400
LSD (0.10)	5.4	NS	100	NS
N Rate (lb/a)				
40	55.0	25.2	1240	45000
80	72.3	25.9	1370	51600
120	70.5	26.7	1260	53800
160	78.6	27.5	1370	53300
LSD (0.05)	6.4	0.8	110	3100
Controls				
No PA - no N	36.6	25.9	900	39900
Starter - no N	37.5	23.6	950	43100
PxN Interaction	NS	NS	NS	NS

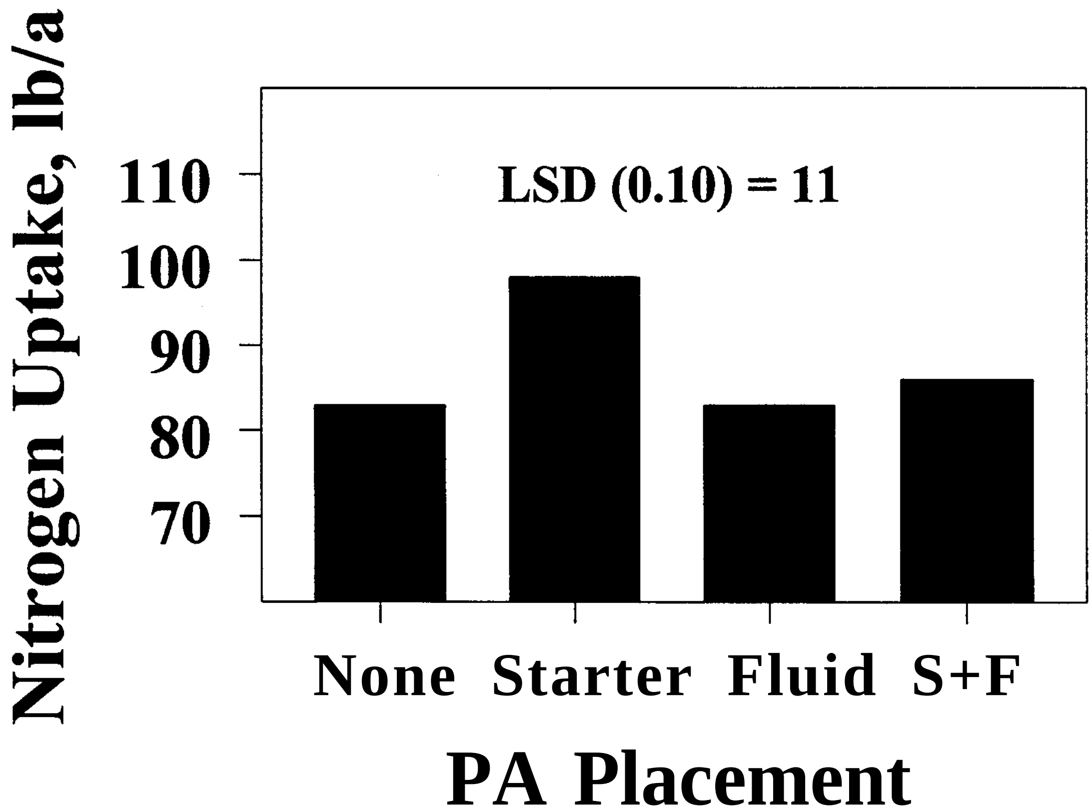

Figure 1. Effect of Polyaspartate (PA) Placement on Nitrogen Uptake by Grain Sorghum at the Soft Dough Growth Stage.

TILLAGE AND NITROGEN FERTILIZATION EFFECTS ON YIELDS IN A GRAIN SORGHUM - SOYBEAN ROTATION

Daniel W. Sweeney

Summary

In 1996, the fourteenth cropping year of a grain sorghum-soybean rotation, tillage systems did not affect soybean yields.

Introduction

Many kinds of rotational systems are employed in southeastern Kansas. This experiment was designed to determine the long-term effect of selected tillage and nitrogen (N) fertilization options on the yields of grain sorghum and soybean in rotation.

Experimental Procedures

A split-plot design with four replications was initiated in 1983, with tillage systems as whole plots and N treatments as subplots. The three tillage systems were conventional, reduced, and no tillage. The conventional system consisted of chiseling, disking, and field cultivation. The reduced-tillage system consisted of disking and field cultivation. Glyphosate (Roundup) was applied each year at 1.5 qt/a to the no-till areas. The four N treatments for the 1983, 1985, 1987, 1989, 1991, and 1993 grain sorghum were a) no N (check), b) anhydrous ammonia knifed to a depth of 6 inches, c) broadcast urea-ammonium nitrate (UAN - 28% N) solution, and d) broadcast solid urea. The N rate was 125 lb/a. Harvests were collected from each subplot for both grain sorghum (odd years) and soybean (even years) crops, even though N fertilization was applied only to grain sorghum.

Results and Discussion

Soybean yield in 1996 was not affected by tillage, but the residual N from anhydrous ammonia applied to the previous year's grain sorghum resulted in about 3 bu/a greater soybean yield than where no N, broadcast urea, or broadcast urea-ammonium nitrate solution had been applied in 1995 (data not shown). The average yield was 34.7 bu/a.

GROWTH AND YIELD RESPONSE OF SHORT-SEASON CORN TO N FERTILIZATION AND TILLAGE[1]

Daniel W. Sweeney and Douglas J. Jardine[2]

Summary

In 1996, poor stands, poor growing conditions, and insect damage may have masked early-season corn response to tillage, nitrogen (N) placement, and N rate. Under these adverse conditions, early-season corn appeared to respond more to changes in N rate than tillage or N placement.

Introduction

Corn grown on the upland soils in southeastern Kansas often is stressed by lack of moisture in July and August. However, short-season hybrids reach reproductive stages earlier than full-season hybrids and may partially avoid the periods with high probabilities of low rainfall during mid-summer. Because short-season hybrids were developed in northern climates, research is lacking concerning nitrogen (N) management in conservation tillage systems in southeastern Kansas.

Experimental Procedures

The experiment was established in 1996 at a remote site in Crawford County in southeastern Kansas. The experiment was a split plot arrangement of a randomized complete block with 4 replications, with tillage systems as whole plots and N fertilizer management as subplots. Tillage systems were ridge and no tillage. Nitrogen fertilizer management treatments were a 3x5 factorial arrangement of urea-ammonium nitrate (UAN) solution placement method (broadcast, dribble, and knife) and N rate (0, 30, 60, 90, and 120 lb/a). Tillage systems were established in 1995, and N fertilizer treatments were initiated in spring 1996. Short-season corn was planted on April 11, 1996.

Results and Discussion

Very dry conditions from fall 1995 to spring 1996 prevented previous grain sorghum stalks from decomposing, resulting in poor planting conditions and substandard corn plant stands. Average yield of short-season corn was low (< 50 bu/a) and may have been partially due to poor stands, poor growing conditions, and insect damage. Grain yield was not affected by tillage or N placement (data not shown). Yield increased with increasing N rate to 60 lb/a but was not increased with higher N rates to 120 lb/a. Adding N tended to decrease lodging except where N was subsurface banded at rates of 90 lb/a or more, which may have led to reduced grain yield. In general, dry matter production was improved with higher N rates during the growing season. Although early growth was not affected by tillage, dry matter production by the dough stage was more with no tillage.

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EFFECT OF SOIL pH ON CROP YIELDS

Kenneth W. Kelley

Summary

In 1996, urea and AgrotaiN urea were compared as topdress N applications for winter wheat at varying soil pH levels ranging from 5.5 to 7.5 at the 0 to 3-in. soil depth. Wheat grain yields significantly increased as soil acidity decreased; however, no significant difference in grain yield occurred between the two urea N sources. Grain yields of grain sorghum, soybean, and wheat also increased as soil acidity decreased during the 4-yr crop rotation.

Introduction

In southeast Kansas, nearly all topsoils are acidic (pH less than 7.0) in nature. Agricultural limestone is applied to correct soil acidity and to improve nutrient availability. However, applying too much lime results in alkaline soil conditions (pH greater than 7.0), which also reduces nutrient availability and increases persistence of some herbicides.

Surface-applied urea fertilizers also are more subject to possible ammonia volatilization, especially when soil pH is above 7.0. AgrotaiN urea is a new fertilizer N source that is supposed to reduce urea N volatilization for up to 14 days following application. This research seeks to evaluate urea and AgrotaiN urea as topdress N sources for wheat at different soil pH levels and to evaluate the effects of soil pH on grain yield for other field crops typically grown in southeastern Kansas.

Experimental Procedure

Beginning in 1989, five soil pH levels (5.5, 6.0, 6.5, 7.0, and 7.5) were established on a native grass site at the Parsons Unit in a 4-yr crop rotation consisting of wheat - [wheat - double-cropped soybean] - grain sorghum. In 1996, two N sources (urea and AgrotaiN urea) and two topdress N rates (30 and 60 lb N/a) were evaluated within each of the five soil pH levels for effects on wheat yield.

Results

In 1996, topsoil conditions remained dry for nearly a month after topdress N was applied in mid-February; however, grain yield response to applied topdress N was significant (Table 1). Urea and AgrotaiN urea produced similar yields at the different pH levels. Highest grain yields occurred when soil pH approached 7.0.

Grain yield responses for the various soil pH treatments during the 4-yr rotation are shown in Table 2. All grain yields increased as soil acidity decreased, except for wheat in 1995. In that year, wheat yield declined at the higher pH range. This study will continue for several more rotations to evaluate soil pH effects.

Table 1. Effect of Varying Soil pH on Grain Yield Response to Topdressed Fertilizer N Applications on Winter Wheat, Southeast Ag Research Center, Parsons, KS, 1996.

		Wheat Yield					
		Soil pH					
N Source	N Rate	5.5	6.0	6.5	7.0	7.5	Avg.
	lb/a	bu/a					
Urea	30	35.1	36.7	41.7	40.0	43.8	39.5
Urea	60	41.3	40.6	44.0	50.8	51.1	45.7
AgrotaiN urea	30	35.9	37.0	41.4	42.1	47.1	40.7
AgrotaiN urea	60	40.6	39.2	42.7	48.3	49.3	44.0
Control	--	28.6	31.6	32.5	38.7	38.3	33.9
Avg.		36.3	37.0	40.5	44.0	45.9	

LSD (0.05):
Comparing lime means = 2.8 bu/a
Comparing fertilizer N for same pH level = 3.3 bu/a
Comparing fertilizer N for different pH level = 4.0 bu/a

Fertilizer N applied on Feb. 20, 1996.

Table 2. Effects of Soil pH on Grain Sorghum, Soybean, and Wheat Yields, Parsons Unit, Southeast Agricultural Research Center.

Soil pH			Grain Yield				
			1993	1994	1995	1996	1996
0-3"	3-6"	6-12"	Gr Sorghum	Soybean	Wheat	Wheat	DC Soybean
			bu/a				
5.4	5.3	5.2	59.4	25.0	18.8	27.4	19.0
5.7	5.5	5.2	65.6	25.9	22.4	32.5	21.5
6.5	5.9	5.2	70.3	35.6	26.0	33.5	22.5
7.0	6.3	5.2	82.6	36.2	29.0	37.2	24.2
7.5	6.7	5.2	84.2	38.3	25.5	38.7	22.6
LSD (0.05):			4.5	3.7	2.6	3.3	1.2

WHEAT AND SOYBEAN ROTATIONS COMPARED

Kenneth W. Kelley and James H. Long

Summary

Full-season soybeans have averaged 5 bu/a higher yields than double-cropped soybeans over a 16-year period. However, when both full-season and double-cropped soybeans were planted at the same time, yields were nearly the same. Full-season soybean yields were significantly higher following [wheat - summer fallow] compared to [wheat - double-crop soybean]. Soybean yields have been highest with maturity group (MG) IV cultivars in both full-season and double-cropped systems. Wheat following early-maturing soybeans (MG I and III) has yielded nearly the same as wheat following wheat.

Introduction

In southeastern Kansas, producers often rotate wheat after full-season soybeans or plant double-cropped soybeans following wheat harvest. Soybean maturity also has a significant effect on grain yield in both full-season and double-cropped systems, and cultivar maturity affects wheat planting date following soybean harvest. Therefore, management practices of one crop can affect the production of the subsequent crop. This research seeks to determine the long-term effects of wheat and soybean rotations on yield and soil properties.

Experimental Procedures

Beginning in 1981, three different wheat and soybean rotations were established at the Parsons Unit: 1) [continuous wheat - double-cropped soybean, 2) [wheat - double-cropped soybean] - full-season soybean, and 3) wheat - wheat - full-season soybeans. Prior to 1988, full-season soybeans were MG V and double-cropped, MG III or IV. Beginning in 1988, MG I, III, IV, and V were compared in both full-season and double-cropped rotations (Rotation # 2). Maturity Group I was planted in early May in 7-inch row spacing, whereas the other full-season maturity groups normally were planted in late May or early to mid-June. Double-cropped soybeans were planted in late June or early July after wheat. However, when wet soil conditions occurred during June, both full-season and double-crop soybeans were planted on the same dates in late June or early July. Prior to 1988, wheat was planted after all double-crop and full-season soybeans had matured, regardless of rotation. However, since 1988, wheat has been planted at different times with respect to individual crop rotations. Fertilizer (phosphorous and potassium) has been applied in various amounts according to amount of nutrients removed in harvested grain from different rotations.

Results and Discussion

Table 1 shows the yearly soybean yields for the three wheat and soybean rotations for the past 16 years. Double-cropped soybean yields have averaged slightly over 20 bu/a, with no difference in yield from continuous double-cropping versus double-cropping every other year. Full-season soybean yields following summer-fallowed wheat have averaged nearly 3 bu/a higher than those following double-cropped soybeans, although in 1996, summer-fallowed plots yielded 13 bu/a higher. Full-season soybeans have averaged about 5 bu/a higher yields than double-cropped soybean, but the variation from year to year has been significant. During the years when wet weather conditions delayed full-season planting (1982, 1985, 1989, 1992, and 1995) until the same time as double-cropped planting, no significant differences occurred in yields among rotations.

Wheat yield as affected by the different crop rotations is shown in Table 2. Yield differences have been more pronounced since wheat has been planted at different dates according to the particular rotation scheme. However, in 1996, yield differences were not significant because of extremely dry soil conditions during late fall and early spring. Since 1988, wheat yields have averaged 7 bu/a higher following wheat compared to wheat following full-season soybeans (MG 5). Wheat following 2 years of soybeans (double-cropped and full-season) has yielded nearly the same as wheat following only 1 year of full-season soybeans. Wheat yields have been lowest in the continuous double-cropped system. Wheat planted after early-maturing soybeans (MG I and III) has yielded nearly the same as wheat following wheat, whereas wheat yields have been lowest following late-maturing soybeans (MG V) (Table 3).

Since 1988, maturity has significantly influenced yield of full-season (Table 4) and double-cropped soybean (Table 5); however, yield variation between years has been greater than when averaged over 9 years. Stafford maturity (late MG IV) has yielded the highest over the 9-yr period for both full-season and double-cropped soybeans. Soybean cyst nematode has not been detected at this site.

Table 1. Effects of Wheat and Soybean Cropping Systems on Soybean Yield, Parsons Unit, Southeast Agricultural Research Center.

Crop Year	(Rot.-1) Wh-DC Soy	(Rot.-2) Wh-DC Soy FS Soy	(Rot.-2) Wh - DC Soy FS Soy	(Rot.-3) Wh - Wh FS Soy	LSD (0.05)
	bu/a				
1981	18.7	18.0	25.8	25.7	3.7
1982*	23.6	23.0	24.3	24.9	NS
1983	17.9	16.9	15.5	14.5	NS
1984	2.1	2.0	11.1	12.8	2.9
1985*	33.2	31.6	32.6	32.1	NS
1986	19.9	17.5	21.2	23.9	3.8
1987	19.5	19.3	35.4	42.6	2.5
1988	9.1	8.4	22.7	25.1	1.5
1989*	27.6	28.0	28.3	29.8	1.7
1990	22.1	23.9	19.6	22.0	1.2
1991	18.6	15.2	24.9	27.3	0.8
1992*	36.6	35.0	37.1	38.7	2.3
1993	22.1	22.5	28.9	35.3	1.3
1994	30.9	29.1	39.6	45.9	3.8
1995*	27.9	26.4	25.4	30.9	2.5
1996	22.4	20.8	30.7	43.7	2.9
Avg.	22.0	21.1	26.4	29.7	

(*) Full-season (FS) and double-cropped (DC) soybeans were planted on the same dates.

Table 2. Effects of Wheat and Soybean Cropping Systems on Wheat Yield, Parsons Unit, Southeast Agricultural Research Center.

Year	(Rot.-1) Wh-DC Soy	(Rot.-2) Wh-DC Soy FS Soy	(Rot.-3) Wheat Wheat FS Soy	(Rot.-3) Wheat Wheat FS Soy	LSD (0.05)
	----------	----------	bu/a	----------	
1982	58.9	55.4	52.1	51.6	4.1
1983	48.4	53.4	51.6	51.9	1.4
1984	51.4	55.1	55.0	54.6	1.6
3-yr avg	52.9	54.6	52.9	52.7	
1988	49.5	52.6	60.5	61.6	6.2
1989	50.3	64.8	64.3	68.6	6.5
1990	30.4	29.5	33.4	23.7	4.5
1991	39.4	46.1	39.5	60.0	6.6
1992	56.1	56.6	56.2	72.9	3.0
1993	10.2	14.2	13.9	39.8	2.4
1994	44.6	38.3	39.3	36.8	3.0
1995	16.3	16.1	15.6	24.1	1.9
1996	35.6	34.2	35.5	34.4	NS
9-yr avg	36.9	39.2	39.8	46.9	

Wheat was not harvested from 1985 through 1987 because of wet soil conditions.
Spring oats were planted in 1986 and 1987 as a substitute for wheat.
Soybean maturity group: Rotation 1 (MG IV), Rotations 2 and 3 (MG V)
From 1982 - 1984, wheat for all rotations was planted on the same date, which was after the latest maturing soybeans (MG V).
Since 1988, wheat has been planted at different times according to the particular cropping system.

Table 3. Effects of Soybean Maturity Group on Wheat Yield, Parsons Unit, Southeast Agricultural Research Center.

Soybean Maturity	Wheat Yield								
	1989	1990	1991	1992	1993	1994	1995	1996	Avg.
	bu/a								
MG I	71.4	25.1	58.2	69.1	43.1	40.5	24.8	32.4	45.6
MG III	68.1	27.5	54.9	67.5	40.5	41.8	26.7	34.9	45.2
MG IV	71.9	36.0	48.3	65.7	17.9	42.1	15.7	33.1	41.3
MG V	64.8	29.5	46.1	57.6	14.2	38.3	16.1	34.2	37.6
Wheat after wheat	68.6	23.7	60.0	72.9	39.8	36.8	24.1	34.4	45.0
LSD (0.05):	5.8	5.1	5.8	2.4	2.5	3.0	1.9	NS	

Crop rotation: [Wheat - double-cropped soybean] - full-season soybean
Planting dates:

1989: Oct. 14, 1988 (MG I,III, & IV) & wheat after wheat
Oct. 24, 1988 (MG V)
1990: Oct. 16, 1989 (MG I & III) & wheat after wheat
Oct. 27, 1989 (MG IV & V)
1991: Oct. 5, 1990 (MG I & III) & wheat after wheat
Oct. 16, 1990 (MG IV & V)
1992: Oct. 7, 1991 (MG I, III, & IV) & wheat after wheat
Oct. 23, 1991 (MG V)
1993: Oct. 14, 1992 (MG I & III) & wheat after wheat
Nov. 2, 1992 (MG IV & V)
1994: Oct. 11, 1993 (MG I & III) & wheat after wheat
Oct. 28, 1993 (MG IV & V)
1995: Oct. 14, 1994 (MG I & III) & wheat after wheat
Oct. 28, 1994 (MG V)
1996: Oct. 13, 1995 (MG I & III) & wheat after wheat
Oct. 19, 1995 (MG IV & V)

Table 4. Comparison of Soybean Maturity Groups in a Full-Season Soybean Crop Rotation, Parsons Unit, Southeast Agricultural Research Center.

		Full-Season Soybean Yield									
MG	Cultivar	1988	1989	1990	1991	1992	1993	1994	1995	1996	Avg.
		bu/a									
I	Weber 84	31.8	31.5	22.0	3.9	38.8	24.4	27.2	18.3	19.0	24.1
III	Flyer	24.0	30.8	14.5	23.8	36.4	28.9	38.1	26.5	41.1	29.3
IV	Stafford	26.9	28.8	16.0	24.0	36.5	30.0	45.7	26.8	37.6	30.3
V	Hutcheson	22.7	28.3	19.6	24.9	37.1	28.9	39.6	25.4	29.3	28.4
	LSD (0.05)	1.5	1.8	1.3	0.8	2.2	1.3	3.8	2.5	2.9	

Rotation is [Wheat - double-cropped soybean] - full-season soybean.

Table 5. Comparison of Soybean Maturity Groups in a Double-Cropped Soybean Crop Rotation, Parsons Unit, Southeast Agricultural Research Center.

		Double-Cropped Soybean Yield									
MG	Cultivar	1988	1989	1990	1991	1992	1993	1994	1995	1996	Avg.
		bu/a									
I	Weber 84	2.0	28.7	10.9	4.2	29.3	13.4	19.9	14.8	7.9	14.6
III	Flyer	2.2	28.9	16.6	14.7	31.6	19.4	35.1	20.9	15.3	20.5
IV	Stafford	8.4	28.0	23.9	15.1	35.0	22.5	29.1	26.4	20.8	23.2
V	Essex	6.5	22.8	20.7	12.1	32.7	19.6	26.6	24.9	2.5	20.8
	LSD (0.05)	1.5	1.8	1.3	0.8	2.2	1.3	3.8	2.5	2.9	

Rotation is [Wheat - double-cropped soybean] - full-season soybean.

LONG-TERM EFFECTS OF CROPPING SYSTEMS ON SOYBEAN YIELDS

Kenneth W. Kelley and James H. Long

Summary

Soybean yields have been highest following grain sorghum or wheat - fallow, regardless of soybean cyst nematode (SCN) infection. In the presence of SCN, continuous soybeans have yielded 25 to 40 % less than soybeans grown in rotation, whereas, in the absence of SCN, continuous soybeans have yielded nearly 15% less.

Introduction

Soybean is a major crop for farmers in southeastern Kansas. Typically, soybeans are grown in several cropping sequences with wheat, grain sorghum, and corn or in a double-cropping rotation with wheat; however, spring rainfall conditions sometimes force producers to plant soybeans after soybeans. With the recent arrival of soybean cyst nematode (SCN) into extreme southeastern Kansas, more information is needed to determine how crop rotations and cultivar resistance can be used to manage around the cyst nematode problem.

Experimental Procedures

In 1979, four cropping rotations were started at the Columbus Unit: 1) [wheat - double-cropped soybean] - soybean, 2) [wheat - summer fallow] - soybean, 3) grain sorghum - soybean, and 4) continuous soybean. Full-season soybean were compared across all rotations in even-numbered years. Beginning in 1984, an identical study was started adjacent to the initial site, so that full-season soybeans also could be compared in odd-numbered years. In 1989, SCN was detected at this second site. Beginning in 1994, cultivars with different maturity and SCN resistance were compared across all four rotations. All rotations received the same amount of phosphorus and potassium fertilizers (80 lb/a each), which were applied to the crop proceeding the full-season soybeans.

Results and Discussion

Soybean yield responses across all rotations in the presence of SCN are shown in Tables 1 and 2 and in the absence of SCN, in Tables 3 and 4. Soybean yields have been highest following grain sorghum or wheat - fallow, regardless of SCN infection. In the presence of SCN, continuous soybeans have yielded 25 to 40 % less than soybeans grown in rotation, whereas, in the absence of SCN, continuous soybeans have yielded nearly 15% less. When comparing grain yield differences among cultivars for 1995 and 1996, soybean maturity has had a greater effect on grain yield than SCN resistance in this study. However, previous soil sampling data have shown that SCN populations were significantly higher for early maturing susceptible cultivars than for later maturing SCN-resistant cultivars. Soil data for 1996 have not been analyzed yet for SCN populations.

Table 1. Effects of Long-Term Cropping Rotations on Soybean Yield in the Presence of Soybean Cyst Nematode, Columbus Unit, Southeast Agricultural Research Center.

Year	Full-Season Soybean Following: Wheat DC Soybean	Grain Sorghum	Wheat Fallow	Soybean	LSD
	------------ bu/a ------------				
1985	31.9	30.9	29.5	27.9	3.2
1987	30.7	31.5	33.2	28.2	3.8
1989 *	27.0	27.5	33.4	20.7	4.5
1991	33.4	39.1	39.4	30.6	5.1
1993	32.5	36.9	37.1	25.3	3.8
5-yr Avg[1]	31.1	33.2	34.5	26.5	

* SCN was detected in continuous soybean rotation beginning in 1989.

[1] Soybean cultivar, MG V - SCN susceptible.

Table 2. Comparison of Soybean Cultivars with Different Maturity and SCN Resistance in Four Crop Rotations in the Presence of SCN, Columbus Unit, SEARC, 1995.

Cultivar	MG	SCN	Full-Season Soybean Following: Wheat DC Soybean	Grain Sorghum	Wheat Fallow	Soybean	Avg.
			--------- bu/a ---------				
Jack	2	Yes	20.1	18.2	21.0	20.1	19.9
Sherman	3	No	21.0	22.6	25.5	23.9	23.3
Flyer	3	No	20.6	22.7	26.0	21.3	22.6
DelSoy 4210	4	Yes	23.5	22.0	24.2	24.7	23.6
Stafford	4	No	21.1	23.6	26.8	24.0	23.9
Manokin	5	Yes	29.3	27.7	30.3	26.9	28.6
Hutcheson	5	No	22.6	24.2	25.0	27.2	24.7
Forrest	5	Yes	25.8	23.7	26.8	24.9	25.3
Avg			23.0	23.1	25.7	24.1	
LSD (0.05):							
Comparing cultivars within same rotation:							3.4
Comparing means of different crop rotations:							NS
Comparing means of soybean cultivar:							1.7

Table 3. Effects of Long-Term Cropping Rotations on Soybean Yield in the Absence of Soybean Cyst Nematode, Columbus Unit, Southeast Agricultural Research Center.

Year	Full-Season Soybean Following: Wheat DC Soybean	Grain Sorghum	Wheat Fallow	Soybean	LSD (0.05)
	----------	----------	bu/a	----------	
1980	12.6	13.3	12.8	10.3	1.0
1982	28.0	30.4	31.9	27.2	3.0
1984	11.8	10.8	12.0	12.1	NS
1986	21.9	23.6	23.9	21.8	1.8
1988	31.3	30.1	32.8	25.2	3.0
1990	22.4	23.4	24.9	22.4	NS
1992	44.1	42.8	43.8	35.6	3.8
1994	41.8	45.2	49.1	38.1	3.0
8-yr avg.[1]	26.7	27.5	28.9	24.1	

[1]Soybean cultivar, MG V.

Table 4. Comparison of Soybean Cultivars with Different Maturity and SCN Resistance in Four Crop Rotations in the Absence of SCN, Columbus Unit, SEARC, 1996.

Cultivar	MG	SCN	Full-Season Soybean Following: Wheat DC Soy	Grain Sorghum	Wheat Fallow	Soybean	Avg.
			----------	----------	bu/a	----------	
Jack	II	Yes	36.5	36.3	41.1	31.3	36.3
Sherman	III	No	42.0	41.7	49.7	36.2	42.4
Flyer	III	No	42.8	47.2	51.3	36.5	44.5
DelSoy 4210	IV	Yes	42.4	43.1	48.6	36.0	42.5
Stafford	IV	No	46.8	46.9	47.3	37.0	44.5
Manokin	V	Yes	46.1	46.7	48.9	40.9	45.7
Hutcheson	V	No	47.1	50.8	53.2	41.5	48.1
Forrest	V	Yes	45.0	46.6	48.8	39.3	44.9
Avg.			43.6	44.9	48.6	37.3	
LSD (0.05):							
Comparing cultivars within same rotation:							6.2
Comparing means of different crop rotations:							6.4
Comparing means of soybean cultivar:							3.4

GRAIN SORGHUM AND SOYBEAN CROPPING SEQUENCES COMPARED

Kenneth W. Kelley

Summary

Soybeans were compared in various cropping sequences following grain sorghum. Soybean yield was highest for first-year soybean following 4 years of grain sorghum. Soybean yields were not significantly different for second-, third-, or fourth-year soybeans. Soybeans grown in a 2-yr rotation with grain sorghum yielded slightly less than the first-year soybean crop.

Introduction

Crop rotation is an important management tool; however, we do not know whether grain sorghum and soybeans differ in sensitivity to continuous cropping or increased frequency within a rotation. If differences do occur, rotation sequences could be developed that include the relatively "monocropping-insensitive" crop more frequently than the "monocropping-sensitive" crop. Further research also is needed to determine if environmental growing conditions affect the "rotation effect" observed for grain sorghum and soybean crops.

Experimental Procedures

Beginning in 1992, various cropping sequences of soybean and grain sorghum have been compared at the Parsons Unit. Treatments include: 1) continuous soybeans and grain sorghum; 2) 2-yr rotation of grain sorghum - soybean; and 3) 1,2,3,4, and 5 years of one crop following 5 years of the other. Yearly fertilizer applications include 60 or 120 lb N, 50 lb P_20_5, and 50 lb K_20/a for grain sorghum and 50 lb P_20_5 - 50 lb K_20/a for soybean. The site had been in native grass prior to establishing the various cropping sequences.

Results and Discussion

Soybean yield responses for the various soybean and grain sorghum cropping sequences are shown in Table 1. Soybean yield was highest for first-year soybean following 4 years of grain sorghum. Yields were not significantly different for second-, third-, fourth-, or fifth-year soybean. Soybean grown in a 2-yr rotation with grain sorghum yielded slightly less than first-year soybean. Results suggest that the rotation effect is most significant for the first crop out of rotation. In 1996, crop rotation had no significant effect on grain sorghum yield (data not shown). This study will continue for several more years to determine if the rotation effect varies with environmental conditions. Plots also will be monitored for plant diseases that may occur over time in the various cropping rotations.

Table 1. Comparison of Soybean Yields in Various Cropping Sequences, Parsons Unit, Southeast Agricultural Research Center, 1996.

Soybean Sequence [1]	Yield	Seed Wt
	bu/a	gr/100
Fifth-year soybean	41.0	11.4
Fourth-year soybean	39.1	12.0
Third-year soybean	37.0	11.8
Second-year soybean	37.9	11.5
First-year soybean	49.4	11.1
Soybean - grain sorghum (2-yr rotation)	46.1	11.6
LSD (0.05):	4.0	0.6

[1]Rotations consist of 1,2,3,4, and 5 years of soybeans following 5 years of grain sorghum. Rotations started in 1992; previous crop was native prairie grass.

EFFECT OF CROP ROTATION AND TILLAGE ON SOYBEANS

Kenneth W. Kelley and Daniel W. Sweeney

Summary

Soybean following grain sorghum yielded significantly higher than soybean following corn; however, no significant difference in grain yield occurred among tillage treatments. In 1996, rainfall distribution was ideal for optimum grain yields; however, more research is needed under varying climatic conditions to determine the long-term effects of tillage and crop rotation on crop yield and plant nutrient uptake.

Introduction

In southeastern Kansas, soybeans are typically grown in rotations with wheat, grain sorghum, or corn. This research seeks to determine which tillage method(s) produce optimum crop yields. In this area, the acreage of doublecropped soybean planted no-till has increased significantly in recent years; however, only a limited acreage of spring crops is planted no-till. In the fall, some wheat is planted no-till into soybean residue, although wheat typically is planted with reduced tillage (disk). Tillage may be necessary to incorporate no-till doublecropped wheat and soybean residues before planting a spring crop, such as corn and grain sorghum, in order to reduce fertilizer N immobilization and to increase soil temperature for faster seed emergence and early seedling growth. However, for full-season soybean following corn or grain sorghum, tillage may or may not be beneficial. Research is needed to determine where tillage is needed within a cropping rotation for the claypan soil conditions of this region.

Experimental Procedures

Beginning in 1994, two 3-yr crop rotations were started at the Columbus Unit. Rotations are: 1) corn - soybean - [wheat - doublecropped soybean] and 2) grain sorghum - soybean - [wheat - doublecropped soybean]. Tillage treatments include: i) grow all crops with conventional tillage (CT), ii) plant all crops no-till (NT), or iii) alternate CT and NT systems. Conventional tillage consisted of disk, chisel, disk, and field cultivate prior to planting. In no-till plots, a systemic herbicide treatment (Roundup + 2,4-D low-volatile ester) was applied in late May to control emerged weeds prior to planting. After planting, a preemeregent herbicide tankmix was applied to both CT and NT plots for annual broadleaf and grass control. Postemergent herbicides were applied as needed to control late-emerging weeds. Whole-plant samples were collected at physiological maturity to determine N, P, and K uptake.

Results and Discussion

Full-season soybean results are shown in Table 1. In 1996, soybean following grain sorghum yielded significantly higher than soybean following corn; however, no significant difference in grain yield occurred among tillage treatments. Whole-plant nutrient analyses indicated that K uptake was significantly lower when soybean followed corn compared to grain sorghum, although soil test results (data not shown) showed similar K levels among previous crops. Plant analyses also showed that whole-plant uptakes of P and K were significantly lower in no-till treatments than conventional tillage. In 1996, rainfall distribution was ideal for optimum grain yields; however, additional evaluations are needed under varying climatic conditions to determine the long-term effects of tillage and crop rotation on crop yield and plant nutrient uptake.

Table 1. Effects of Previous Crop and Tillage on Subsequent Full-Season Soybean, Columbus Unit, Southeast Agricultural Research Center, 1996.

Previous		Soybean		Seed	Plant Nutrient Uptake		
Crop	Tillage[1]	Tillage[1]	Yield	Weight	N	P	K
			bu/a	gr/100	------------- lb/a -------------		
Corn	NT	NT	44.8	12.0	103	8.7	50
Corn	CT	CT	46.4	13.0	116	10.0	70
Corn	NT	CT	52.0	13.3	118	8.8	66
Corn	CT	NT	42.0	12.1	95	6.7	40
Grain sorghum	NT	NT	48.3	12.8	116	9.1	60
Grain sorghum	CT	CT	52.9	12.6	124	11.5	87
Grain sorghum	NT	CT	55.2	12.7	114	8.9	70
Grain sorghum	CT	NT	54.8	12.6	106	8.7	62
Means:							
Previous Crop							
Corn			46.3	12.6	108	8.6	57
Grain sorghum			52.8	12.7	115	9.5	70
LSD (0.05):		5.2	NS	NS	NS	12	
Tillage							
NT			46.5	12.3	110	8.9	55
CT			49.6	12.9	120	10.8	79
Alternate (CT)		53.6	13.0	116	8.9	68	
Alternate (NT)		48.4	12.4	100	7.7	51	
LSD (0.05):		NS	NS	NS	2.4	16	

[1]CT = conventional tillage (chisel - disk); NT = no-tillage.

SOYBEAN HERBICIDE RESEARCH

Kenneth Kelley

Summary

Various herbicide treatments and application methods were compared for weed control in soybean under conventional-tillage and no-till conditions.

Introduction

Soybeans occupy approximately 40% of the crop acreage in southeastern Kansas. Herbicide studies are conducted to compare performance and application methods for the control of annual and broadleaf and grassy weeds in soybeans. Because of the interest in conservation tillage practices, herbicides also are evaluated in no-till (full-season and double-cropped) conditions.

Experimental Procedures

Soybean herbicide trials were conducted at the Columbus and Parsons Units and at an off-station site infected with soybean cyst nematode (SCN) in Cherokee County. Soybeans were grown in 30-inch row spacing. All treatments were applied with a tractor-mounted, compressed-air sprayer with a spray volume of 20 GPA. Plots were four rows wide by 30 ft. long and replicated three times. The center two rows of each plot were harvested for yield. Preplant treatments were incorporated with a three-bar tine mulcher. Weed ratings were visual estimates of percent weed control.

Results and Discussion

Conventional Tillage (Columbus Unit)

Preplant incorporated (Table 1), preemergent (Table 2), and postemergent (Table 3) herbicide treatments were compared at the Columbus Unit using conventional tillage. Preplant incorporated applications provided excellent control of crabgrass, cocklebur, and ivyleaf morningglory. Rainfall during the month of June amounted to only 0.7 inch, but weed control was still good with most preemergent herbicide treatments. Postemergent herbicides were applied during early July when weeds were small and actively growing, which resulted in excellent control. Postemergent herbicide treatments that included Cobra or Storm resulted in moderate leaf burning, but plants soon recovered, and yields were not affected. Common waterhemp control was good for nearly all post treatments, except for First Rate.

Conventional Tillage (SCN-Infected Site)

Grain yield and weed control results for the SCN site in Cherokee County are shown in Table 4. Grain yields were significantly higher for 5292 (SCN resistant) than Stafford (SCN susceptible); however, both cultivars appeared to response similarly to different herbicides and application methods. Soybean yields varied somewhat with herbicide treatments, although results over the past 3 years have shown that grain yields likely will not be affected by any specific herbicide mode of action in SCN-infected soils.

No-Till Full-Season (Columbus Unit)

Herbicide results for full-season soybean planted no-till into standing grain sorghum stubble that had been rotary mowed are shown in Table 4. Preplant applications of either Roundup Ultra or Gramoxone Xtra combined with 2,4-D LVE (low-volatile ester) gave excellent burn-down weed control, although a tank-mix of Canopy, 2,4-D (LVE), and crop oil also was effective as a burn-down treatment. When residual herbicides were added to early burn-down or preplant treatments, early-season weed control was satisfactory; however, postemergent herbicides were still needed to control late-emerging broadleaf and grassy weeds, because plots were not cultivated. If no residual herbicides were applied prior to soybean emergence, two postemergent applications were needed to control weeds that emerged at different times. No-till grain yields were comparable with those for conventional tillage plots. In 1997, additional research is planned to evaluate mechanical cultivation as an alternative to late postemergent herbicide applications for control of late-emerging weeds.

No-Till Double-Cropped (Parsons Unit)

Herbicide results for double-cropped soybean planted no-till into standing wheat stubble are shown in Tables 5 and 6. Planting date was delayed until rainfall was received in early July. Roundup Ultra applied after wheat harvest gave good burn-down weed control. Rainfall after planting was marginal (0.7 in.) for preemergent herbicide activation, but control of pigweed and crabgrass generally was satisfactory, except for Dual and Frontier treatments (Table 5). Crabgrass control was better with early postemergent herbicide applications (Table 6), because grass was taller and growing less actively when later postemergent treatments were applied. Smooth pigweed control was satisfactory, except for First Rate, which gives better pigweed control when applied to soil rather than postemergent.

Table 1. Effects of Preplant Incorporated Herbicides on Weed Control in Soybeans, Columbus Unit, Southeast Agricultual Research Center, 1996.

Trt	Time	Herbicide	Rate	Yield	Weed Control Lacg	Weed Control Cocb	Weed Control Ilmg
			product/a	bu/a	%	%	%
1	PP	Squadron	3 pt	32.8	98	93	96
2	PP	Tri-Scept	2.33 pt	36.5	98	97	95
3	PP	Squadron	3 pt	37.4	98	98	97
	PP	Authority	4 oz				
4	PP	Prowl	1.8 pt	37.4	98	92	93
	PP	Canopy	6 oz				
5	PP	Prowl	1.8 pt	36.1	98	94	96
	PP	Scepter	1.4 oz				
	PP	Sencor	0.33 lb				
6	PP	Detail	1 qt	34.0	98	96	94
7	PP	Prowl	1.8 pt	37.3	98	95	97
	PP	Scepter	2.1 oz				
	PP	Authority	4 oz				
8	PP	Prowl	2.4 pt	34.6	98	98	98
	PP	Scepter	2.1 oz				
9	PP	Freedom	3 qt	35.4	98	97	96
	PP	Scepter	2.1 oz				
10	PP	Prowl	1.8 pt	33.7	98	93	97
	PP	Scepter	2.1 oz				
	PP	Command	0.5 pt				
11	PP	Pursuit Plus	2.5 pt	36.0	98	94	95
12	PP	Commence	1 qt	38.3	98	97	94
	PP	Canopy	5 oz				
13	PP	Treflan + Broadstrike	1 qt	37.3	98	89	94
14		No Herbicide	--	27.4	0	0	0
LSD (0.05):				3.2	NS	4	5

Lacg = large crabgrass; Cocb = cocklebur; Ilmg = ivyleaf morningglory.
PP = preplant (6/12); Planted 6/12/96. Weed rating = 7/16/96.

Table 2. Effects of Preemergent Herbicides on Weed Control in Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1996.

					Weed Control		
Trt	Time	Herbicide	Rate	Yield	Lacg	Cocb	Ilmg
			product/a	bu/a	%	%	%
1	Pre	Detail	1 qt	33.4	98	89	90
2	Pre	Dual + Broadstrike	1 qt	34.0	98	88	90
3	Pre	Dual	1.5 pt	35.2	98	98	97
	Pre	First Rate	0.6 oz				
4	Pre	Turbo	1 qt	29.8	98	92	70
5	Pre	Lasso	1.5 qt	35.7	98	94	96
	Pre	Canopy	5 oz				
6	Pre	Frontier	22 oz	34.5	98	91	93
	Pre	Authority	0.42 lb				
7	Pre	Lasso	1.5 qt	37.4	98	92	91
	Pre	Scepter	2.1 oz				
	Pre	Authority	4 oz				
8	Pre	Dual	1.5 pt	34.0	98	95	92
	Pre	Authority	0.33 lb				
	Pre	Classic	0.02 lb				
9	--	No Herbicide	---	23.4	0	0	0
LSD (0.05):				3.7	NS	4	4

Lacg = large crabgrass; Cocb = cocklebur; Ilmg = morningglory.
Planted 6/12/96. Pre = preemergent (6/12/96). Weed rating = 7/16/96.

Table 3. Effects of Postemergent Herbicides on Weed Control in Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1996.

Trt	Time	Herbicide	Rate	Yield	Crop Injury	Weed Control Cocb	Vele	Ilmg	Cowh
			product/a	bu/a	%	%	%	%	%
1	Post	Resource	4 oz	37.8	1.5	90	100	88	93
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
2	Post	Resource	4 oz	37.6	3.0	100	100	87	90
	Post	Basagran	0.5 pt						
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
3	Post	Stellar	5 oz	39.5	3.0	100	100	93	98
	Post	Classic	0.38 oz						
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
4	Post	Stellar	5 oz	35.8	3.5	95	98	92	96
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
5	Post	Cobra	8 oz	35.7	3.5	90	93	90	93
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
6	Post	Stellar	5 oz	36.8	3.0	100	95	86	97
	Post	Scepter	1.4 oz						
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
7	Post	Scepter	1.4 oz	36.9	1.0	98	10	60	83
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
8	Post	Classic	0.38 oz	39.4	1.5	100	92	90	87
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
9	Post	Concert	0.5 oz	37.3	1.8	97	92	86	88
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						

(continued)

Table 3. Effects of Postemergent Herbicides on Weed Control in Soybeans, Southeast Agricultural Research Center, 1996 (continued).

Trt	Time	Herbicide	Rate	Yield	Crop Injury	Weed Control Cocb	Vele	Ilmg	Cowh
			product/a	bu/a	%	%	%	%	%
10	Post	Raptor	4 oz	38.1	1.0	97	88	80	87
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
11	Post	First Rate	0.6 oz	35.0	1.0	100	85	80	50
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
12	Post	Expert	1.5 oz	39.9	1.0	100	88	89	93
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
13	Post	Storm	1.5 pt	35.3	3.5	100	100	95	97
	Post	Crop Oil	1 pt						
	Post	28 % N	1 % v/v						
14	--	No Herbicide	---	23.6	--	0	0	0	0
LSD (0.05):				4.1	4	6	8	8	9

Crop injury rating: 1 = no injury, 5 = severe leaf burning.
Cocb = cocklebur; Vele = velvetleaf; Ilmg = morningglory; Cowh = common waterhemp.
Planted 6/12/96. Post = postemergent (7/15/96). Weed rating = 7/22/96.

Table 4. Effects of Herbicide Mode of Action on Weed Control and Soybean Yield on Soil Infected with Soybean Cyst Nematode, Cherokee County, KS, 1996.

Trt	Time	Herbicide	Rate	Variety	Yield	Weed Control Cocb	Weed Control Lacg
			product/a		bu/a	%	%
1	PPI	Squadron	3 pt	5292	36.3	98	97
2	PPI	Squadron	3 pt	Stafford	24.2	97	97
3	PPI	Treflan	1.5 pt	5292	36.6	89	98
	PPI	Canopy	6 oz				
4	PPI	Treflan	1.5 pt	Stafford	23.1	94	98
	PPI	Canopy	6 oz				
5	PPI	Scepter	2.8 oz	5292	37.4	93	86
6	PPI	Scepter	2.8 oz	Stafford	24.3	93	85
7	PPI	Canopy	6 oz	5292	34.0	88	84
8	PPI	Canopy	6 oz	Stafford	23.2	90	82
9	PPI	Treflan	1.5 pt	5292	34.7	89	98
	Po	Classic	0.66 oz				
	Po	Cobra	6 oz				
	Po	Crop Oil	1 % v/v				
10	PPI	Treflan	1.5 pt	Stafford	22.8	92	98
	Po	Classic	0.66 oz				
	Po	Cobra	6 oz				
	Po	Crop Oil	1 % v/v				
11	PPI	Prowl	1.8 pt	5292	33.3	94	98
	Po	Scepter	2.1 oz				
	Po	Cobra	6 oz				
	Po	Crop Oil	1 % v/v				
12	PPI	Prowl	1.8 pt	Stafford	24.4	95	98
	Po	Scepter	2.1 oz				
	Po	Cobra	6 oz				
	Po	Crop Oil	1 % v/v				

(continued)

Table 4. Effects of Herbicide Mode of Action on Weed Control and Soybean Yield on Soil Infected with Soybean Cyst Nematode, Cherokee County, KS, 1996 (continued).

Trt	Time	Herbicide	Rate	Variety	Yield	Weed Control Cocb	Weed Control Lacg
			product/a		bu/a	%	%
13	SPPI	Detail	1 qt	5292	39.7	86	97
14	SPPI	Detail	1 qt	Stafford	22.1	87	97
15	SPPI	Freedom	3 qt	5292	40.3	90	96
	SPPI	Canopy	6 oz				
16	SPPI	Freedom	3 qt	Stafford	27.9	90	95
	SPPI	Canopy	6 oz				
Means							
Variety							
5292 (SCN resistant)					36.5	92	96
Stafford (SCN susceptible)					24.0	91	96
LSD (0.05):					2.0	NS	NS
Herbicide			Time of Application				
Squadron			PPI		30.2	98	97
Treflan + Canopy			PPI		29.9	92	98
Scepter			PPI		30.9	93	85
Canopy			PPI		28.6	89	83
Treflan + Classic + Cobra			PPI + Post		28.7	91	98
Prowl + Scepter + Cobra			PPI + Post		28.8	94	98
Detail			Shallow PPI		30.9	87	97
Freedom + Canopy			Shallow PPI		34.1	90	96
LSD (0.05):					2.3	8	5

Planted 6/11/96. Weed rating 7/30.
PPI = preplant (6/11); SPPI = shallow preplant (6/11); Po = postemergent (7/16)
Cocb = cocklebur; Lacg = large crabgrass.

Table 5. Effects of Herbicides and Time of Application on Weed Control for Soybeans Planted No-Till, Columbus Unit, Southeast Agricultural Research Center, 1996.

Trt	Time	Herbicide	Rate	Yield	Weed Control Lacg 6/30	Lacg 7/22	Vele 7/22	Cocb 7/22	Ilmg 7/22
			product/a	bu/a	%	%	%	%	%
1	EPP	Canopy	6 oz	40.7	88	98	98	97	88
	EPP	2,4-D, LVE	1 pt						
	EPP	Crop Oil	1 qt						
	E-Po	Assure II	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Cobra	6 oz						
	Po	2,4-DB	2 oz						
	Po	Crop Oil	1 % v/v						
2	EPP	Roundup	1.5 pt	36.5	88	98	98	98	89
	EPP	Canopy	6 oz						
	EPP	2,4-D, LVE	1 pt						
	E-Po	Assure II	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Cobra	6 oz						
	Po	2,4-DB	2 oz						
	Po	Crop Oil	1 % v/v						
3	EPP	Roundup	1.5 pt	43.7	89	98	98	97	90
	EPP	Squadron	3 pt						
	EPP	2,4-D, LVE	1 pt						
	E-Po	Select	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Stellar	5 oz						
	Po	28 % N	2 % v/v						
	Po	Crop Oil	1 pt						
4	EPP	Roundup	1.5 pt	41.1	92	98	98	98	90
	EPP	Dual + Broadstrike	2 pt						
	EPP	2,4-D, LVE	1 pt						
	E-Po	Poast Plus	1.5 pt						
	E-Po	Crop Oil	1 pt						
	Po	Basagran	1 pt						
	Po	2,4-DB	2 oz						
	Po	Crop Oil	1 % v/v						

(continued)

Table 5. Effects of Herbicides and Time of Application on Weed Control for Soybeans Planted No-Till, Columbus Unit, Southeast Agricultural Research Center, 1996 (continued).

					Weed Control				
Trt	Time	Herbicide	Rate	Yield	Lacg 6/30	Lacg 7/22	Vele 7/22	Cocb 7/22	Ilmg 7/22
			product/a	bu/a	%	%	%	%	%
5	PP	Roundup	2 pt	40.3	87	98	98	98	90
	PP	Dual	1.5 pt						
	PP	Canopy	6 oz						
	PP	2,4-D, LVE	1 pt						
	E-Po	Assure II	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Cobra	6 oz						
	Po	2,4-DB	2 oz						
	Po	Crop Oil	1 % v/v						
6	PP	Roundup	2 pt	40.7	88	98	98	98	90
	PP	Prowl	1.8 pt						
	PP	Scepter	2.1 oz						
	PP	Authority	4 oz						
	PP	2,4-D, LVE	1 pt						
	E-Po	Select	8 oz						
	E-Po	Crop Oil	1 qt						
7	PP	Roundup	2 pt	38.2	89	98	98	95	90
	PP	Dual	1.5 pt						
	PP	First Rate	0.6 oz						
	PP	2,4-D, LVE	1 pt						
	E-Po	Fusion	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Basagran	1 pt						
	Po	2,4-DB	2 oz						
	Po	28 % N	1 qt						
	Po	Crop Oil	1 % v/v						
8	PP	Roundup	2 pt	38.9	98	95	98	98	90
	PP	Pursuit Plus	2.5 pt						
	PP	2,4-D, LVE	1 pt						
	E-Po	Blazer	1 pt						
	E-Po	2,4-DB	2 oz						
	E-Po	28 % N	1 qt						
	E-Po	Crop Oil	1 % v/v						

(continued)

Table 5. Effects of Herbicides and Time of Application on Weed Control for Soybeans Planted No-Till, Columbus Unit, Southeast Agricultural Research Center, 1996 (continued).

Trt	Time	Herbicide	Rate	Yield	Weed Control				
					Lacg 6/30	Lacg 7/22	Vele 7/22	Cocb 7/22	Ilmg 7/22
			product/a	bu/a	%	%	%	%	%
9	PP	Gramoxone Xtra	2.5 pt	38.5	87	98	96	98	90
	PP	Prowl	2.4 pt						
	PP	2,4-D, LVE	1 pt						
	PP	NIS	0.25 % v/v						
	E-Po	Select	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Raptor	5 oz						
	Po	28 % N	1 qt						
	Po	NIS	0.25 % v/v						
	Po	2,4-DB	2 oz						
10	PP	Gramoxone Xtra	2.5 pt	43.6	87	98	96	95	90
	PP	Dual	2 pt						
	PP	2,4-D, LVE	1 pt						
	PP	NIS	0.25 % v/v						
	E-Po	Poast Plus	1.5 pt						
	E-Po	Crop Oil	1 qt						
	Po	Expert	1.5 oz						
	Po	28 % N	1 qt						
	Po	Crop Oil	1 % v/v						
11	PP	Gramoxone Xtra	2.5 pt	39.6	91	98	98	98	90
	PP	Lasso	2 qt						
	PP	2,4-D, LVE	1 pt						
	PP	NIS	0.25 % v/v						
	E-Po	Select	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Stellar	5 oz						
	Po	Scepter	1.4 oz						
	Po	28 % N	2 % v/v						
	Po	Crop Oil	1 pt						

(continued)

Table 5. Effects of Herbicides and Time of Application on Weed Control for Soybeans Planted No-Till, Columbus Unit, Southeast Agricultural Research Center, 1996 (continued).

Trt	Time	Herbicide	Rate	Yield	Weed Control Lacg 6/30	Lacg 7/22	Vele 7/22	Cocb 7/22	Ilmg 7/22
			product/a	bu/a	%	%	%	%	%
12	PP	Gramoxone Xtra	2.5 pt	42.3	89	98	98	90	90
	PP	Frontier	22 oz						
	PP	2,4-D, LVE	1 pt						
	PP	NIS	0.25 % v/v						
	E-Po	Fusion	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Storm	1.5 pt						
	Po	28 % N	1 qt						
13	PP	Roundup	2 pt	46.8	88	98	95	96	90
	PP	2,4-D, LVE	1 pt						
	E-Po	Assure II	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Synchrony STS	0.5 oz						
	Po	28 % N	2 qt						
	Po	Crop Oil	1 % v/v						
14	PP	Roundup	2 pt	35.0	89	98	95	96	90
	PP	2,4-D, LVE	1 pt						
	E-Po	Select	8 oz						
	E-Po	Crop Oil	1 qt						
	Po	Synchrony STS	0.5 oz						
	Po	2,4-DB	2 oz						
	Po	28 % N	2 qt						
	Po	Crop Oil	1 pt						
15	PP	Roundup	2 pt	28.2	85	60	60	72	40
	PP	2,4-D, LVE	1 pt						
LSD (0.05):				6.0	4	5	13	12	8

Lacg = large crabgrass; Vele = velvetleaf; Cocb = cocklebur; Ilmg = ivyleaf morningglory.
Planted 6/7/96.
EPP = early preplant (5/21); PP = preplant (5/30); E-Po = early postemergent (7/1);
Po = postemergent (7/15); Weed rating: Lacg (6/30 & 7/22); Cocb and Vele = 7/22; Ilmg = 7/22.
Previous crop was grain sorghum.

Table 6. Effects of Herbicides and Time of Application on Weed Control for Double-cropped Soybeans Planted No-Till, Parsons Unit, Southeast Agricultural Research Center, 1996.

Trt	Time	Herbicide	Rate	Yield	Weed Control		
					Smpw	Lacg	Volw
			product/a	bu/a	%	%	%
1	PP	Roundup	1.5 pt	27.5	98	98	92
	Pre	Canopy	5 oz				
	Po	Assure II	8 oz				
	Po	Crop Oil	1 qt				
2	PP	Roundup	1.5 pt	27.9	98	98	93
	Pre	Scepter	2.1 oz				
	Po	Select	8 oz				
	Po	Crop Oil	1 qt				
3	PP	Roundup	1.5 pt	29.0	98	96	93
	Pre	Lorox (+)	12 oz				
	Po	Assure II	8 oz				
	Po	Crop Oil	1 qt				
4	PP	Roundup	1.5 pt	27.6	95	98	93
	Pre	Sencor	0.33 lb				
	Po	Fusion	8 oz				
	Po	Crop Oil	1 qt				
5	PP	Roundup	1.5 pt	29.3	98	98	95
	Pre	Scepter	2.1 oz				
	Pre	Authority	4 oz				
	Po	Select	8 oz				
	Po	Crop Oil	1 qt				
6	PP	Roundup	1.5 pt	26.6	98	98	93
	Pre	Authority	4 oz				
	Po	Select	8 oz				
	Po	Crop Oil	1 qt				
7	PP	Roundup	1.5 pt	29.3	98	77	10
	Pre	Lasso	2 qt				
8	PP	Roundup	1.5 pt	26.9	70	77	10
	Pre	Dual	1 qt				

(continued)

Table 6. Effects of Herbicides and Time of Application on Weed Control for Double-cropped Soybeans Planted No-Till, Parsons Unit, Southeast Ag Research Center, 1996 (continued).

					Weed Control		
Trt	Time	Herbicide	Rate	Yield	Smpw	Lacg	Volw
			product/a	bu/a	%	%	%
9	PP	Roundup	1.5 pt	24.1	60	60	10
	Pre	Frontier	22 oz				
10	PP	Roundup	1.5 pt	30.2	98	93	80
	Pre	Lasso	1.5 qt				
	Pre	Lorox (+)	12 oz				
11	PP	Roundup	1.5 pt	26.1	98	90	77
	Pre	Dual	1.5 pt				
	Pre	Canopy	5 oz				
12	PP	Roundup	1.5 pt	29.0	98	95	84
	Pre	Frontier	20 oz				
	Pre	Scepter	2.1 oz				
13	PP	Roundup	1.5 pt	24.4	98	73	10
	Pre	Dual + Broadstrike	1 qt				
14	PP	Roundup	1.5 pt	22.0	50	50	0
LSD (0.05):				3.0	8	7	7

Smpw = smooth pigweed; Lacg = large crabgrass; Volw = volunteer wheat.
PP = preplant (6/21); Pre = preemergent (7/9); Po = postemergent (8/8).
Planted 7/9/96. Weed rating = 8/20/96.

Table 7. Effects of Herbicides and Time of Application on Weed Control for Double-cropped Soybeans Planted No-Till, Parsons Unit, Southeast Ag Research Center, 1996.

					Weed Control		
Trt	Time	Herbicide	Rate	Yield	Smpw	Lacg	Volw
			product/a	bu/a	%	%	%
1	PP	Roundup	1.5 pt	28.8	96	88	88
	E-Po	Raptor	4 oz/a				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Select	8 oz				
	Po	Crop Oil	1 qt				
2	PP	Roundup	1.5 pt	25.0	98	70	85
	E-Po	Stellar	5 oz				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Select	8 oz				
	Po	Crop Oil	1 qt				
3	PP	Roundup	1.5 pt	27.0	94	94	92
	E-Po	Classic	0.5 oz				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Assure II	8 oz				
	Po	Crop Oil	1 qt				
4	PP	Roundup	1.5 pt	27.5	98	75	88
	E-Po	Scepter OT	1 pt				
	E-Po	Crop Oil	1 pt				
	Po	Select	8 oz				
	Po	Crop Oil	1 qt				
5	PP	Roundup	1.5 pt	27.1	94	98	93
	E-Po	Storm	1.5 pt				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Poast Plus	1.5 pt				
	Po	Crop Oil	1 qt				

(continued)

Table 7. Effects of Herbicides and Time of Application on Weed Control for Double-cropped Soybeans Planted No-Till, Parsons Unit, Southeast Ag Research Center, 1996, (continued).

Trt	Time	Herbicide	Rate	Yield	Weed Control Smpw	Lacg	Volw
			product/a	bu/a	%	%	%
6	PP	Roundup	1.5 pt	27.5	98	93	92
	E-Po	Concert	0.5 oz				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Assure II	8 oz				
	Po	Crop Oil	1 qt				
7	PP	Roundup	1.5 pt	26.6	80	88	91
	E-Po	Expert	1.5 oz				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Assure II	8 oz				
	Po	Crop Oil	1 qt				
8	PP	Roundup	1.5 pt	27.5	43	96	90
	E-Po	First Rate	0.6 oz				
	E-Po	Crop Oil	1 pt				
	E-Po	28 % N	1 qt				
	Po	Fusion	8 oz				
	Po	Crop Oil	1 qt				
9	PP	Roundup	1.5 pt	27.8	95	95	90
	E-Po	Assure II	8 oz				
	E-Po	Crop Oil	1 qt				
	Po	Cobra	6 oz				
	Po	Crop Oil	1 pt				
10	PP	Roundup	1.5 pt	27.3	80	95	93
	E-Po	Poast Plus	1.5 pt				
	E-Po	Crop Oil	1 qt				
	Po	Blazer	1 pt				
	Po	Crop Oil	1 pt				

(continued)

Table 7. Effects of Herbicides and Time of Application on Weed Control for Double-cropped Soybeans Planted No-Till, Parsons Unit, Southeast Ag Research Center, 1996 (continued).

Trt	Time	Herbicide	Rate	Yield	Weed Control		
					Smpw	Lacg	Volw
			product/a	bu/a	%	%	%
11	PP	Roundup	1.5 pt	25.8	85	98	88
	E-Po	Select	8 oz				
	E-Po	Crop Oil	1 qt				
	Po	Cobra	4 oz				
	Po	Crop Oil	1 pt				
12	PP	Roundup	1.5 pt	26.4	78	96	95
	E-Po	Fusion	8 oz				
	E-Po	Crop Oil	1 qt				
	Po	Scepter OT	1 pt				
	Po	Crop Oil	1 pt				
13	PP	Roundup	1.5 pt	27.6	79	95	88
	E-Po	Fusilade 2000	1.5 pt				
	E-Po	Crop Oil	1 qt				
	Po	Storm	1 pt				
	Po	Crop Oil	1 pt				
14	PP	Roundup	1.5 pt	22.0	30	50	0
LSD (0.05):				2.9	9	5	5

Smpw = smooth pigweed; Lacg = large crabgrass; Volw = volunteer wheat.
PP = preplant (6/21); E-Po = early postemergent (7/30); Po = postemergent (8/8).
Planted 7/9/96. Weed rating 8/20/96.

SOYBEAN VARIETY TRIAL FOR CYST NEMATODE RESISTANCE

James H. Long, William T. Schapaugh[1], **Ted Wary**[2] **, and Timothy C. Todd**[3]

Summary

Soybeans varieties with resistance to cyst nematode have prevented as much as 50 % of the grain yield loss seen for varieties without such resistance in Cherokee County, Kansas since 1991. Severe drought occurred in 1995, whereas 1993, 1994, and 1996 were normal to wet years. Several varieties in both Maturity Groups IV and V had very good yield potential and adequate soybean cyst nematode resistance. These could be used in suitable rotations to combat the pest.

Introduction

The appearance of soybean cyst nematode in Southeastern Kansas has complicated the production of soybeans by requiring a definite plan to combat the pest. Part of this planning is to use varieties that are resistant to the nematode. Ongoing trials to identify adapted resistant varieties were established in an area of the southeast region, Cherokee County, known to have damaging populations of the pest.

Experimental Procedures

Forty eight varieties of soybeans, some rated as resistant to cyst nematode, were planted on June 6, 1996. The 1996 trial was grown in cooperation with Gary and Neil Martin in Columbus, Kansas. Seed were planted at eight per row foot in 30-inch rows. Maturities were rated in September and October, and plots were harvested with a plot combine in October. Test weight and seed moisture were measured with a Dickey-John analyzer, and grain yields were adjusted to 13 % moisture.

Results and Discussion

Varieties with resistance to soybean cyst nematode prevented yield losses of 30 % to 40% during the years 1993 - 1996 (Table 1). Resistant Maturity Group (MG) V varieties such as 'Manokin', and 'Pioneer 9521' averaged yields over 37 bu/a over the 4-year period. Susceptible varieties of similar maturity, such as 'Essex', had average yields of only 20 to 25 bu/a during the same period. Several early MG IV varieties yielded more than 30 bu/a during the 1993-96 period and were superior to Flyer , the standard susceptible variety that yielded approximately 21 bu/a during that same period. Several new mid to late MG IV varieties have just been put into the performance test and look very promising. More variety test information can be found in Report of Progress 776, 1996 Kansas Performance Tests with Soybean Varieties.

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Table 1. Grain Yield of Cyst Nematode-Resistant and -Susceptible Soybean Varieties in Southeastern Kansas, 1993 through 1996 and Summaries.

			Grain Yield					Average Yield	
Brand	Variety	MG	1993	1994	1995	1996	2-yr	3-yr	4-yr
			------------------------------------			bu/a		------------------------------------	
Asgrow	A4341	IV	--	--	--	19.3	--	--	--
Asgrow	A4922	IV	--	--	27.4	33.6	30.5	--	--
Dekalb	CX469C	IV	--	34.5	27.3	30.7	31.1	33.9	--
Dekalb	CX510C	V	--	--	--	32.0	--	--	--
Delange	DS466	IV	--	--	--	38.0	--	--	--
Dynagro	3444	IV	--	--	--	32.7	--	--	--
Dynagro	3502N	V	--	--	--	28.7	--	--	--
Golden Harvest	H1454	IV	--	--	25.6	29.9	27.7	--	--
Golden Harvest	H1500	V	--	--	30.4	31.3	30.8	--	--
ICI	D454	IV	--	--	--	26.6	--	--	--
ICI	D473	IV	--	--	--	32.6	--	--	--
ICI	D485	IV	--	--	--	29.8	--	--	--
Merschman	Phoenix	IV	--	--	--	22.3	--	--	--
MSG	G 4320	IV	--	--	--	31.8	--	--	--
MSG	G 5023N	IV	--	--	--	29.2	--	--	--
Midland	XP401CN	IV	--	--	--	28.2	--	--	--
Midland	8475	IV	--	39.3	28.4	33.9	31.1	33.9	--
Mycogen	429	IV	--	--	25.6	31.7	28.6	--	--
NC +	4A27	IV	--	41.3	30.3	32.8	31.6	34.8	--
NC +	5A15	V	32.5	38.1	27.7	33.4	30.6	33.1	32.9
NC +	5A44	V	--	--	--	35.3	--	--	--
Northrup King	S46-44	IV	--	33.6	27.3	34.1	30.7	31.7	--
Northrup King	S52-25	V	--	41.3	30.2	29.2	29.7	33.6	--
Northrup King	S57-11	V	--	--	28.4	33.4	30.9	--	--
Pioneer	9481	IV	--	--	--	34.4	--	--	--
Pioneer	9491	IV	--	39.5	28.8	30.1	29.6	32.9	--
Pioneer	9521	V	39.2	42.5	31.2	38.7	35.0	37.5	37.9
Terra	TS4292	IV	--	34.8	27.3	29.8	28.6	30.6	--
Terra	TS4792	IV	33.4	33.8	27.5	31.5	29.5	30.9	31.6
Terra	TS5504	V	--	--	--	31.0	--	--	--
Willcross	9541N	IV	--	--	--	32.9	--	--	--
Willcross	9547N	IV	--	--	30.3	31.3	30.8	--	
Willcross	9644N	IV	--	--	--	34.6	--	--	--
Willcross	9650N	V	--	--	--	32.6			
Public	Flyer	IV	18.8	20.2	18.1	25.3	21.7	21.2	20.6
Public	Stafford	IV	21.8	29.3	20.9	25.7	23.3	25.3	24.4
Public	Essex	V	22.9	28.8	19.3	37.4	20.8	23.5	23.3
Public	Holladay	V	--	34.9	22.1	26.4	24.2	27.8	--
Public	Hutcheson	V	25.4	31.5	23.2	26.0	24.6	26.9	26.5
Public	Delsoy 4710	IV	--	39.2	26.9	31.4	29.2	32.5	--
Public	Delsoy 4900	IV	35.7	36.9	29.3	29.9	29.6	32.1	33.0
Public	Manokin	IV/V	36.2	42.2	32.3	37.4	34.9	37.3	37.0
Public	Forrest	V	34.7	39.5	31.2	32.1	31.7	34.3	34.4
Public	Hartwig	V	34.5	36.1	30.5	28.2	29.4	31.6	32.3
Public	KS 5292	V	--	--	28.7	27.7	28.2	--	--
Public	Stressland	IV	--	--	19.3	26.7	23.0	--	--
Public	K1307	V	--	--	--	30.5	--	--	--
Average			29.5	35.6	26.9	30.2	--	--	--
L.S.D. (.05: '93, .1 '94-'96)			2.3	3.6	2.7	3.8	--	--	--

PERFORMANCE TRIAL OF DOUBLE-CROPPED SOYBEAN VARIETIES

James H. Long and Gary L. Kilgore[1]

Summary

Nineteen double-cropped soybean varieties were planted following winter wheat in Altamont, Kansas and evaluated for yield and other agronomic characteristics throughout the summer of 1996. Grain yields were low, and variety differences were seen under the poor growing conditions. Yields ranged from 6.5 bu/a to near 22 bu/a. The short-season Maturity Group (MG) III and IV varieties matured during the first week of October, whereas long-season varieties in MG V matured as much as 2 weeks later. Generally, all varieties were short - less than 2 feet tall. One variety suffered some shattering, probably because of its earliness.

Introduction

Double-cropped soybean is an opportunistic crop grown after winter wheat over a wide area of southeast Kansas. Because this crop is vulnerable to weather-related stress, such as drought and early frosts, it is important that the varieties have not only high yield potential under these conditions but also the plant structure to allow them to set pods high enough to allow harvest. They also should mature before a threat of frost.

Experimental Procedures

Soybean varieties were planted to moisture following winter wheat harvest with the help of John Frazier of Altamont, Kansas. The soil is a Cherokee/Parsons silt loam. The wheat stubble was disked, and field cultivated several times prior to planting. Soybeans then were planted on June 29, 1996 at 10 seed per foot of row. Very hot conditions following planting delayed emergence and caused uneven stands. Poast was applied for grass postemerge, and a cultivation was used before canopy closure. Warm and dry conditions persisted until late summer, reducing growth and yield potential. Rainy fall conditions then delayed harvest. The soybeans finally were harvested on December 19, 1996.

Results and Discussion

Yields ranged from 6.5 bu/a to 20.9 bu/a (Table 1). Several varieties yielded 15 bu/a or more, which was good for this dry growing season. Consideration should be given to plant height, the height to the first pod, and maturity during years such as 1996. Overall plant height ranged from only 11.3 to 20.5 in., and the height to the first pod ranged from 0 to 2.8 in. Most varieties matured before October 15, however, some MG V varieties matured later.

[1] Southeast Area Extension Agronomist, Chanute.

Table 1. Yield of Double-Cropped Variety Trial for Soybeans at Columbus, Parsons, and Altamont, Kansas, 1994-1996.

Brand	Variety	Yield 1996	Yield 1995	Yield 1994	1996 Characteristics Ht	Ht to 1st pod	Mat +/- Sep30	Mat 2 yr Sep30
		----------bu/a---------			------in------			
Dynagro	3367	10.9	--	--	14.5	1.0	-1.0	--
Pioneer	9396	8.5	--	--	13.8	0.8	0.8	--
Dynagro	3375	10.8	--	--	16.5	0.5	3.0	--
Hoegemeyer	401	10.9	--	--	14.5	0.0	3.3	--
Mycogen	395	7.5	--	--	12.0	1.3	4.3	--
Public Early Check	Flyer	10.1	14.9	17.0	15.8	0.8	5.0	4.4
Mycogen	467	9.3	12.6	--	15.3	1.0	5.0	5.4
Delange	DS401	14.5	--	--	15.3	1.0	5.5	--
Dekalb	CX445	10.2	--	--	15.0	1.3	6.0	--
Pioneer	9472	16.5	16.9	--	20.5	1.5	8.0	7.3
Dekalb	CX494	11.6	--	--	16.0	1.5	8.0	--
Midland	8486	10.8	--	--	16.8	1.3	9.5	--
Asgrow	4341	7.4	--	--	12.3	0.5	10.5	--
Northrup King	46-44	14.9	17.7	--	16.0	1.3	10.5	8.4
Public Mid Check	KS4694	6.5	--	--	11.3	0.3	12.8	--
Asgrow	4701	9.8	--	--	17.8	0.5	13.8	--
Pioneer	9521	21.9	--	--	20.0	2.8	17.0	--
Public Late Check	Manokin	17.4	19.8	26.5	15.3	2.0	17.0	14.5
Public Late Check	KS5292	13.3	13.8	25.4	15.8	2.0	17.4	15.7
	L.S.D. (0.05)	5.6	--	--	3.9	1.1	4.0	--
	Averages	11.4	15.6	23.6	15.5	1.1	--	--

PERFORMANCE TRIAL OF RIVER-BOTTOM SOYBEAN VARIETIES

James H. Long and Gary L. Kilgore[1]

Summary

Eleven soybean varieties, typically grown on deep river bottom soils, were planted at Erie, Kansas and evaluated for yield and other agronomic characteristics throughout the summer of 1996. Grain yields were excellent, and variety differences were seen with the very productive soils. Yields ranged from 51.7 bu/a to near 71 bu/a. The shorter-season Maturity Group (MG) IV varieties outyielded the MG V varieties. The soybeans were tall, and some lodging did occur.

Introduction

Full-season soybeans are grown on the highly productive river bottom soils of southeast Kansas. Because this crop is not as vulnerable to weather-related stress, such as drought, it is important that the varieties have high yield potential and low levels of lodging. In addition, it is important that the crop be harvested before fall rains make clayey soils impassable or heavier precipitation causes flooding.

Experimental Procedures

Eleven soybean varieties were grown following a fallow year after flooding in 1995. The farmer/cooperator was Joe Harris. The soil is a Lanton deep silt loam that sits on the Neosho flood plain approximately 750 feet from the river channel. The soil was diked twice and field cultivated prior to planting. Soybeans then were planted on May 28, 1996 at 10 seed per foot of row. Plants emerged to form an excellent stand. Dual and Lexone herbicide was applied after planting and Basagran was applied postemerge to help control cocklebur. The plots then were cultivated before canopy closure. Warm and dry conditions persisted until late summer; however, the soybeans grew well all year. August and September rain during pod fill made for excellent yields. The soybeans were harvested on October 17, 1996.

Results and Discussion

Yields ranged from 51.7 bu/a to 70.8 bu/a (Table 1). Several varieties yielded more than 65 bu/a. Consideration should be given to plant height and its effect on lodging as well as plant maturity. Overall plant height ranged from 37 to 46 in, and most lodging occurred in the tallest varieties. With respect to plant maturity, the indeterminate, early to mid MG IV varieties outyielded the determinate growth habit, MG V varieties in the test.

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[1] Southeast Area Extension Agronomist, Chanute, KS.

Table 1. Yield of River-Bottom Soybean Variety Trial at Erie, Kansas, 1996.

Brand	Variety	Yield	Characteristics		
			Lodging	Height of Plant	Mat +/- Sep30
		--------bu/a-----------	-%-	-in-	
Hoegemeyer	401	64.5	3.8	39.8	-1.0
Delange	DS410	62.4	4.4	42.4	0.8
Midland	8410	59.9	6.3	40.3	3.0
Midland	8413	66.8	0.0	38.5	3.3
Mycogen	470	59.0	19.4	46.1	4.3
Pioneer	9521	51.7	15.0	42.0	5.0
Pioneer	9412	70.8	0.0	37.0	5.5
Asgrow	4341	65.9	2.5	37.3	6.0
Public Early Check	Flyer	66.2	6.3	38.8	1.5
Public Mid Check	KS4694	65.7	6.3	41.8	8.0
Public Late Check	KS5292	58.1	11.3	40.3	9.5
	Averages	62.8	6.8	40.4	--
	(L.S.D. 0.05)	6.9	9.2	5.1	--

PERFORMANCE TRIAL OF SUNFLOWER HYBRIDS WITH TWO PLANTING DATES

James H. Long and Gary L. Kilgore[1]

Summary

Nineteen sunflower hybrids were grown on upland soils and evaluated for yield and other agronomic characteristics throughout the summer of 1996. Timely rains allowed for excellent seed yields, and differences were seen. Yields ranged from 1000 to near 1600 lb/a. The second (late) planting yielded as well as the early full-season planting.

Introduction

Sunflowers are grown in southeast Kansas to provide a high oil, high energy supplement for the birdseed market. They also can be grown after winter wheat in a double-crop system. It is important that the varieties have high yield potential under the dry and hot conditions of southeast Kansas in summer and low levels of lodging, because sunflower is a tall crop.

Experimental Procedures

Nineteen sunflower hybrids were grown in 1996 following a previous crop of soybeans on the Mark Piper farm. The soil is a Catoosa silt loam (formerly Newtonia silt loam) that sits on a ridge top overlooking the Labette Creek flood plain. Treflan herbicide was applied, the soil was diked and field cultivated, and 90 lb/a of N were added prior to planting. The first planting occurred on May 28, and the second planting occurred following a field cultivation on June 24, 1996. Stands were thinned back to 20,000 plants/a stands. The plots were then cultivated before canopy closure. Warm and dry conditions persisted until late summer; however, the sunflowers grew well all year. August rains made for excellent yields. The sunflowers were harvested on October 4, for the early planting and on October 15, 1996 for the second planting.

Results and Discussion

Yields ranged from less than 1000 lb/a to well over 2000 lb/a (Tables 1 and 2). Average yield from both planting dates was near 1500 lb/a of seed. Four hybrids, Cargill SF 187, Cargill SF177, Pioneer 6451, and NK 231, were in the top yield group for both plantings. Consideration should be given to the height and lodging characteristics of each hybrid. Sunflowers can be tall, and average height for the first planting date was over 5 ft. Two hybrids had lodging problems, which affected their seed yields.

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[1] Southeast Area Extension Agronomist, Chanute, KS.

Table 1. Seed Yield of Sunflower Hybrids Planted on May 28, 1996 , Southeastern Kansas.

			Characteristics	
Brand	Variety	Yield	Lodging	Height of Plant
		bu/a	-%-	-in-
Cargill	SF187	1884	0.0	57.3
Cargill	SF128	1268	10.0	61.7
Cargill	SF177	2083	1.0	68.0
Dekalb	3790	1575	8.3	63.0
Dekalb	3868	1471	7.0	57.7
Dekalb	3881	1677	2.3	55.7
Dekalb	3904	1479	8.7	62.0
Mycogen	Cavalry	1842	0.7	67.7
Mycogen	9338	1684	0.7	67.0
Mycogen	956	1444	6.7	64.3
Triumph	546	735	63.3	58.3
Triumph	565	1216	4.0	63.7
Pioneer	6451	1694	2.0	61.3
Northrup King	NK231	1759	0.7	63.7
Interstate	IS611	1507	2.0	58.0
Interstate	IS6077	1754	2.3	63.0
	Averages	1567	7.5	62.0
	(L.S.D. 0.05)	6.9	9.2	5.1

Table 2. Seed Yield of Sunflower Hybrids Planted on June 24, 1996, Southeastern Kansas.

Brand	Variety	Yield	Characteristics		
			Lodging	Height of Plant	Bloom Aug.
		bu/a	-%-	-in-	
Cargill	SF187	1840	0.7	46.0	17.3
Cargill	SF128	1687	3.7	49.0	14.7
Cargill	SF177	1763	2.0	55.3	17.3
Dekalb	3790	1369	3.7	45.7	14.7
Dekalb	3868	1552	3.7	46.3	14.3
Dekalb	3881	1154	2.0	40.3	16.7
Dekalb	3904	2093	0.7	47.7	14.3
Mycogen	Cavalry	609	65.0	49.0	16.0
Mycogen	9338	1421	2.3	51.3	17.7
Mycogen	956	1076	2.3	48.3	14.7
Triumph	546	1338	6.7	48.0	15.3
Triumph	565	1291	2.0	50.3	17.0
Pioneer	6451	1888	2.3	45.0	16.0
Northrup King	NK231	2199	0.7	48.0	15.7
Interstate	IS611	1249	2.3	46.3	13.3
Interstate	IS6077	1415	3.7	53.7	17.0
	Averages	1496	6.9	48.1	15.8
	(L.S.D. 0.05)	569	17.1	4.2	1.6

Bloom dates in August are averages of three measurements.

ANNUAL WEATHER SUMMARY FOR PARSONS - 1996

Mary Knapp[1]

1996 DATA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max	39.2	51.0	52.1	67.7	78.0	85.3	88.3	87.9	77.5	69.7	48.9	45.9	66.0
Avg. Min	18.6	23.7	29.4	41.1	59.2	64.3	67.9	66.5	54.6	46.3	32.0	25.1	44.0
Avg. Mean	28.9	37.3	40.7	54.4	68.6	74.8	78.1	77.2	66.1	58.0	40.5	35.5	55.0
Precip	0.61	0.14	1.09	3.1	4.29	1.97	3.25	5.10	8.81	2.56	4.45	0.34	35.74
Snow	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Heat DD*	1120	803	752	329	52	9	0	0	72	233	737	914	5019
Cool DD*	0	0	0	11	163	303	406	378	104	16	0	0	1380
Rain Days	4	2	7	3	9	10	9	6	7	8	10	2	77
Min < 10	6	5	2	0	0	0	0	0	0	0	0	5	18
Min ≤ 32	29	23	16	3	0	0	0	0	0	1	17	21	110
Max ≥ 90	0	0	0	0	1	12	14	10	1	0	0	0	38

NORMAL (1961-1990 Average)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max	40.5	46.6	57.1	68.2	76.8	85.2	91.7	90.1	81.5	71.3	56.8	44.5	67.5
Avg. Min	19.3	24.8	34.2	45.8	55.5	64.1	69.0	66.4	59.1	47.3	35.7	24.8	45.5
Avg. Mean	29.9	35.7	45.7	57.0	66.2	74.7	80.3	78.3	70.3	59.4	46.3	34.7	56.5
Precip	1.32	1.46	3.40	3.80	5.26	4.61	3.15	3.63	4.80	3.92	2.91	1.76	40.02
Snow	2	3	1.5	0	0	0	0	0	0	0	2	0	8.5
Heat DD*	1088	820	598	261	88	0	0	0	31	220	561	939	4606
Cool DD*	0	0	0	21	125	294	474	412	190	46	0	0	1562

DEPARTURE FROM NORMAL

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max	-1.3	4.4	-5.0	-0.5	1.2	0.1	-3.4	-2.2	-4.0	-1.6	-7.9	1.4	-1.6
Avg. Min	-0.7	-1.1	-4.8	-4.7	3.7	0.2	-1.1	0.1	-4.5	-1.0	-3.7	0.3	-1.5
Avg. Mean	-1.0	1.6	-5.0	-2.6	2.4	0.1	-2.2	-1.1	-4.3	-1.4	-5.8	-1.5	-1.7
Precip	-0.71	-1.32	-2.31	-0.67	-0.97	-2.64	0.1	1.47	4.01	-1.36	1.54	-1.42	-4.28
Snow	0.0	-3.0	-1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	0.0	-6.5
Heat DD*	32	-18	154	68	-36	9	0	0	41	13	176	-25	413
Cool DD*	0	0	0	-10	38	9	-68	-34	-87	-30	0	0	-182

* Daily values were computed from mean temperatures. Each degree that a day's mean temperature is below (or above) 65° F is counted as one heating (or cooling) degree day.

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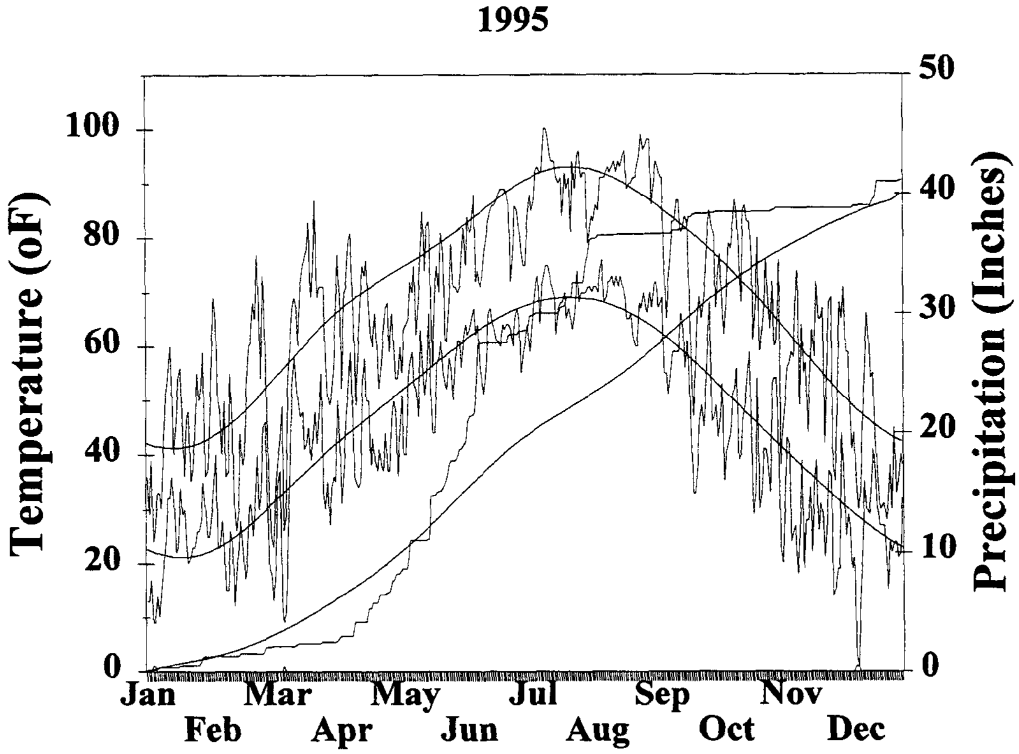
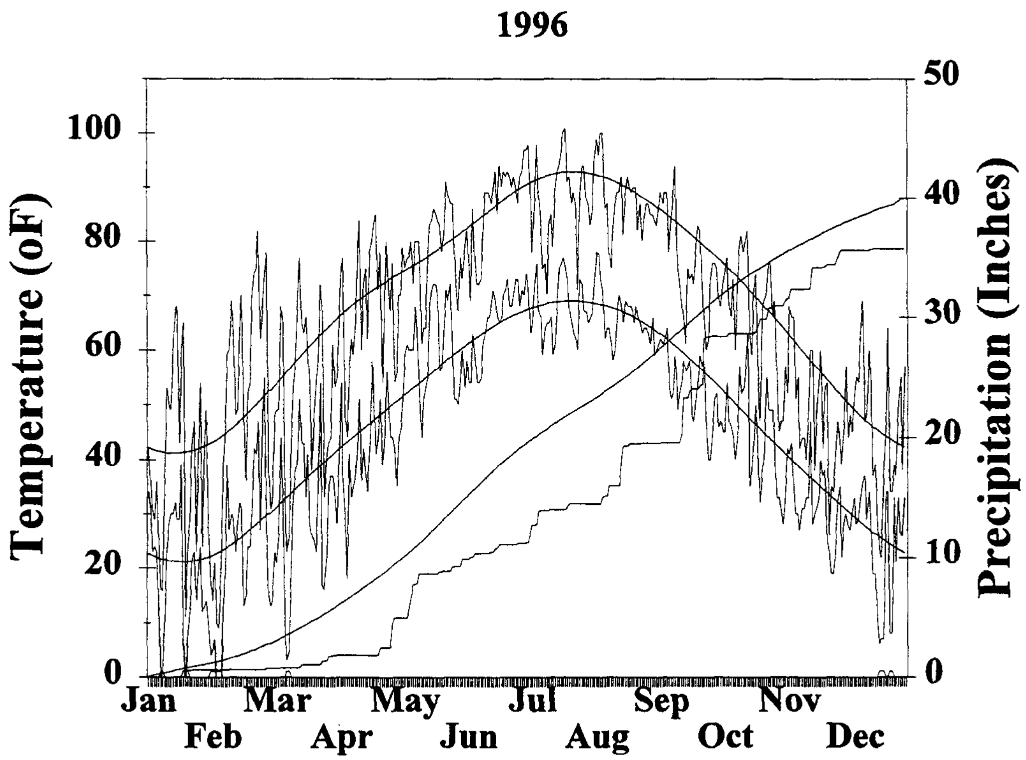
WEATHER SUMMARY FOR PARSONS





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