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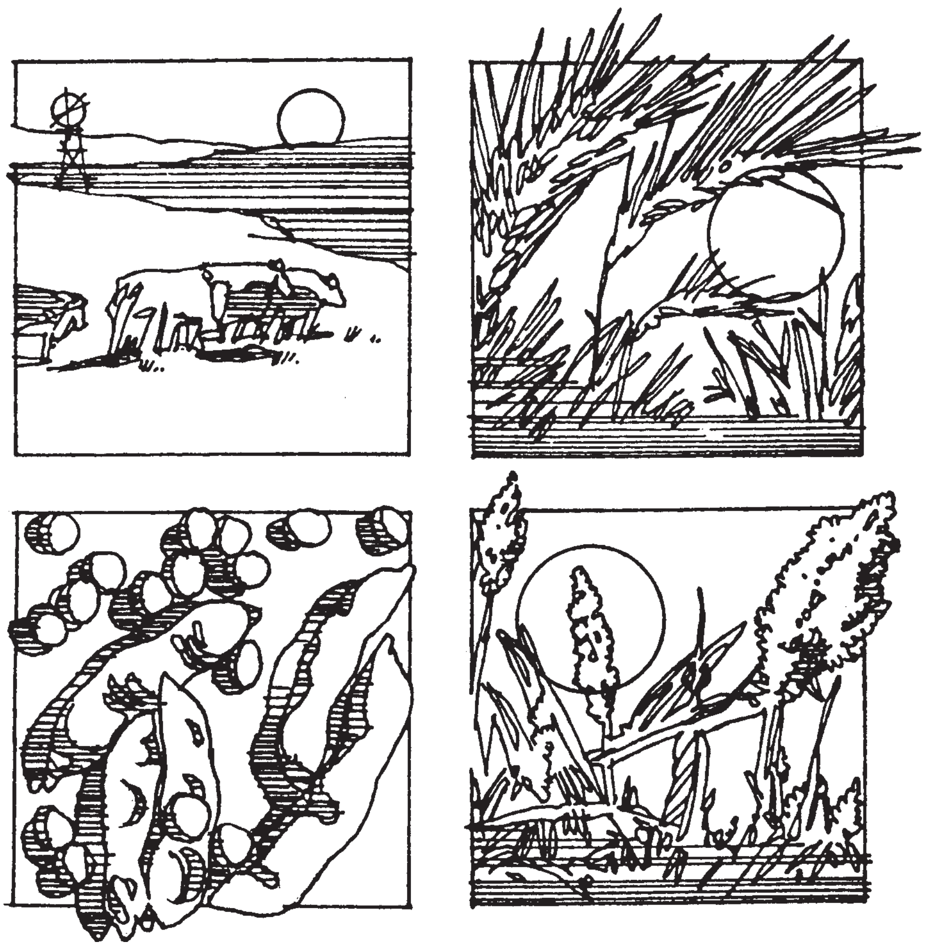
1999 AGRICULTURAL RESEARCH



Report of Progress 834

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

SOUTHEAST AGRICULTURAL RESEARCH CENTER

LYLE LOMAS, Research Center Head and Animal Scientist, received B.S. and M.S. degrees in Animal Husbandry from the University of Missouri and a Ph.D. degree in Animal Husbandry from Michigan State University. He provides leadership for research, is responsible for administration, and directs beef cattle research at the Research Center. Lyle joined the staff in 1979 as Animal Scientist and became Head in 1986. His research interests are beef cattle nutrition and forage utilization by grazing beef cattle.

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EFFECTS OF INTERSEEDING LEGUMES INTO ENDOPHYTE-INFECTED TALL FESCUE PASTURES ON FORAGE PRODUCTION AND STEER PERFORMANCE

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

Summary

A total of 135 steers grazed high-endophyte tall fescue pasture interseeded with either lespedeza, red clover, or ladino clover during 1995, 1996, and 1997. Legume cover, forage dry matter production, grazing steer performance, and subsequent feedlot performance were measured. Legume treatment caused no differences in forage availability. Grazing gains corresponded to the amount of legume coverage present. Results of this study indicate that interseeding high-endophyte fescue pastures with ladino clover produced higher stocker gains during the grazing phase than interseeding with lespedeza or red clover. Legume treatment had no effect on subsequent finishing gains.

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, and 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 (*Neotyphodium coenophialum* Glen, Bacon, Price, and Hanlin formerly *Acremonium coenophialum*). Pastures were fertilized in September 1994 with 40-40-40 and in September 1995, 1996, and 1997 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 ladino clover, 12 lb/a of 'Kenland' red clover, or 15 lb/a of 'Marion' striate lespedeza. Pastures were seeded again in mid-March of 1996 and early March of 1997 with the same respective legumes that were

[1]Southeast Area Extension Crops & Soils Specialist, Chanute.

planted in 1995, except that Korean rather than Marion lespedeza was planted. Seeding rates in 1996 were 6 lb/a of Regal ladino clover , 13 lb/a of Kenland red clover, and 17 lb/a of Korean lespedeza. Seeding rates in 1997 were 4 lb/a of Regal ladino clover, 12 lb/a of Kenland red clover, and 14 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 sq ft) were placed in each pasture; total production was estimated 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, 1996, and 1997, 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, April 24, and April 1 in 1995, 1996, and 1997, respectively. Initial weights of steers utilized in 1995, 1996, and 1997 were 690, 524, and 516 lb, respectively. Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkeye. Steers grazed for 200, 168, and 220 days in 1995, 1996, and 1997, 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 and steers were weighed on October 16 and 17, October 8 and 9, and November 6 and 7 in 1995, 1996, and 1997, respectively.

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 grazed during 1995, 1996, and 1997 were fed a finishing diet for 164, 139, and 154 days, respectively, and slaughtered in a commercial facility. Carcass data were collected.

Results and Discussion

Pastures

Available forage dry matter and legume coverage of the pastures for 1995, 1996, and 1997 are presented in Figures 1, 2, and 3, respectively. Legume treatment caused no differences in forage availability during any year. However, forage availability was less in 1996 than in 1995 and 1997, 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. In 1997, dry matter production and legume coverage were both higher than in previous years because of the favorable rainfall pattern.

In 1995, canopy coverages of legumes were generally less than 10%. Stands of legumes likely were diminished by extremes of spring drought followed by wet soils in early summer and drought again in late summer. Coverage was higher ($P<.05$) in red clover-seeded pastures than in other legume pastures in March and April, but coverage was greatest in the lespedeza pastures by the end of June. Lespedeza coverage in cages appeared higher than for the other legumes at the end of summer, but this was not significant ($P>.20$). In 1996, cover was higher for lespedeza than for red or ladino clover. Cover was highest for lespedeza and lowest for red clover during July and August. In 1997, cover for most of the season was higher for ladino clover than for red clover or lespedeza, particularly during July and August.

Cattle Performance

Grazing and subsequent finishing performances of steers grazing fescue pastures interseeded with the various legumes in 1995, 1996, and 1997 are presented in Table 1. Results are listed by year for each legume treatment, because a significant (P < .05) treatment x year interaction occurred. Differences in grazing performance due to legume treatment increased each year during the duration of the study. Steers grazing pastures interseeded with lespedeza or ladino clover had identical (P = .82 and P = .93) gains in 1995 and 1996, respectively. In 1995, steers grazing red clover gained 11.3% less (P = .13) and 10.4% less (P = .19) than those grazing lespedeza and ladino clover, respectively. In 1996, steers grazing red clover gained 12.1% less (P = .08 and P = .07) than those grazing lespedeza and ladino clover, respectively. In 1997, steers grazing pastures interseeded with ladino clover gained 35.6% more (P = .0001) and 28.1% more (P = .0001) than those grazing pastures interseeded with lespedeza and red clover, respectively. Gains of steers grazing pastures interseeded with red clover or lespedeza were similar (P = .26).

Subsequent finishing gains and feed efficiencies were similar among legume treatments during all 3 years. Few differences in carcass measurements were observed for cattle grazing in 1995 and 1996. However, steers that grazed ladino clover during 1997 had heavier (P = .0002 and P = .0004) hot carcass wt., greater (P = .01 and P = .03) fat thickness, and higher (P = .01 and P = .02) numerical yield grade than steers that had grazed pastures interseeded with lespedeza and red clover, respectively. Steers that grazed lespedeza in 1997 had lower (P = .02 and P = .004) marbling scores and fewer (P = .03 and P = .01) percent choice carcasses than those that grazed red clover and ladino, respectively.

Overall gains (grazing plus finishing phase) were similar among legume treatments during 1995 and 1996. However, steers that grazed ladino during 1997 had higher (P = .008 and P = .01) overall gains than those that grazed red clover and lespedeza, respectively.

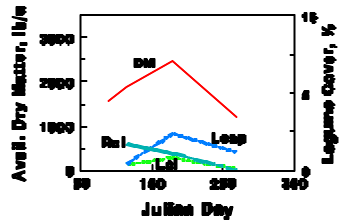

Figure 1. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1995, Southeast Agricultural Research Center.

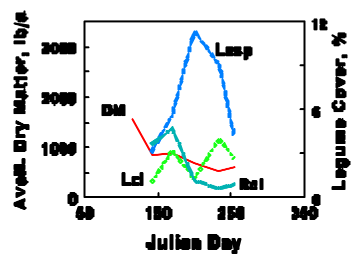

Figure 2. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1996, Southeast Agricultural Research Center.

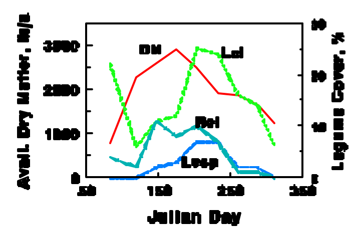

Figure 3. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1997, Southeast Agricultural Research Center.

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

	1995			1996			1997		
Item	Lespedeza	Red Clover	Ladino Clover	Lespedeza	Red Clover	Ladino Clover	Lespedeza	Red Clover	Ladino Clover
Grazing Phase									
No. of days	200	200	200	168	168	168	220	220	220
No. of head	15	15	15	15	15	15	15	15	15
Initial wt., lb	690	694	691	524	524	524	512	517	519
Ending wt., lb	926	906	924	757	733	758	813[a]	838[a]	930[b]
Gain, lb	236	212	233	233	209	234	301[a]	321[a]	411[b]
Daily gain, lb	1.18	1.06	1.17	1.39	1.24	1.39	1.37[a]	1.46[a]	1.87[b]
Finishing Phase									
No. of days	164	164	164	139	139	139	154	154	154
No. of head	15	15	15	14	15	14	15	15	15
Starting wt., lb	926	906	924	762[a,b]	733[a]	763[b]	813[a]	838[a]	930[b]
Final wt., lb	1404	1386	1367	1223	1207	1227	1318[a]	1313[a]	1408[b]
Gain, lb	478	480	443	461	474	464	505	475	478
Daily gain, lb	2.91	2.93	2.70	3.31	3.41	3.34	3.28	3.08	3.10
Daily DM intake, lb	25.7	25.0	25.2	23.5	23.5	23.6	25.5	25.7	26.1
Feed/gain	8.9	8.6	9.4	7.1	6.9	7.1	7.8	8.3	8.4
Hot carcass wt., lb	867	862	844	756	735	761	781[a]	789[a]	858[b]
Dressing %	61.8	62.1	61.7	61.8[a]	60.9[b]	62.1[a]	59.2[a]	60.1[a,b]	60.9[b]
Backfat, in	.44	.46	.49	.29	.30	.24	.41[a]	.45[a]	.56[b]
Ribeye area, in^2	14.5	14.1	14.0	14.9[a]	14.0[a]	16.2[b]	12.4	12.3	13.0
Yield grade	2.3[a,b]	2.1[a]	2.5[b]	1.7	1.6	1.3	2.9[a]	3.0[a]	3.5[b]
Marbling score	SM^{63}	SM^{63}	SM^{89}	SM^{21a}	SM^{03a,b}	SL^{59b}	SM^{21a}	SM^{97b}	MT^{22b}
% Choice	87	80	87	57	40	43	67[a]	93[b]	100[b]
Overall Performance (Grazing + Finishing Phase)									
No. of days	364	364	364	307	307	307	374	374	374
Gain, lb	714	692	677	698	683	702	806[a]	796[a]	889[b]
Daily gain, lb	1.96	1.90	1.86	2.27	2.22	2.29	2.15[a]	2.13[a]	2.38[b]

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

EFFECTS OF LEGUME PERSISTENCE IN ENDOPHYTE-INFECTED TALL FESCUE PASTURES ON FORAGE PRODUCTION AND STEER PERFORMANCE

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

Summary

In 1998, 45 steers grazed high-endophyte tall fescue pasture that had been interseeded with either lespedeza, red clover, or ladino clover during each of the 3 previous years. No additional legume was seeded in 1998 in order to evaluate legume persistence. Legume cover, forage dry matter production, and grazing steer performance were measured. Cattle grazing pastures interseeded with ladino clover gained significantly ($P < .05$) more than those grazing pastures interseeded with lespedeza or red clover. Gains from pastures interseeded with red clover or lespedeza were similar ($P > .05$).

Introduction

Interseeding legumes into high-endophyte 'Kentucky 31' tall fescue pastures has proven to be an effective means of minimizing the negative effect of the endophyte on performance of grazing beef cattle. White clover is the predominant legume seeded with tall fescue especially in the southeastern U.S.; however, lespedeza and red clover also are used in specific areas. Legume persistence is extremely important in this production system, because legume seed is a major expenditure. This project was conducted as a follow-up of the study reported in the previous article to compare legume persistence, forage production, and grazing performance and subsequent feedlot performance of stocker steers grazing high-endophyte tall fescue pastures that had been interseeded previously 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 were used in a 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 (*Neotyphodium coenopialum* Glen, Bacon, Price, and Hanlin) and had been interseeded with lespedeza ('Marion' in 1995 and Korean in 1996 and 1997), 'Regal' ladino clover, or 'Kenland' red clover using a no-till drill in each of the previous 3 years. No additional legume seed was planted in 1998 in order to determine the persistence of legumes planted in previous years (see previous article). All pastures were fertilized with 16-40-40 lb/a of N-P_2O_5 in September of 1997 and 1998.

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 sq ft) were placed in each pasture; total production was estimated 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

Forty-five mixed-breed steers with an initial weight of 573 lb were weighed on consecutive days, stratified by weight, and allotted randomly to

[1]Southeast Area Extension Crops & Soils Specialist, Chanute.

the nine pastures on April 1, 1998. Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkeye. 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. One steer was removed from one of the lespedeza pastures for reasons unrelated to experimental treatment. Pastures were grazed continuously at a stocking rate of 1 steer/a. Grazing was terminated and steers were weighed on November 9 and 10 (223 days). Following the grazing period, cattle were shipped to a finishing facility for the finishing portion of this study which had not been completed when this publication was printed.

Results and Discussion

Pastures

Available forage dry matter for each legume treatment is shown in Figure 1. Pastures interseeded with ladino clover or red clover had higher available forage dry matter than those interseeded with lespedeza during the early part of the study. Available forage dry matter production was similar among legume treatments during the latter part of the study.

Legume cover for each legume treatment is shown in Figure 2. Legume cover was higher in pastures interseeded with ladino clover than in those seeded with red clover or lespedeza. Legume cover was similar in pastures interseeded with red clover or lespedeza.

Cattle Performance

Performance of steers grazing fescue pastures interseeded with the various legumes is presented in Table 1. Daily gains for pastures interseeded with ladino clover, red clover, and lespedeza were 1.24, 1.03, and .93 lb, respectively. Cattle grazing pastures interseeded with ladino clover gained significantly ($P < .05$) more than those grazing pastures interseeded with lespedeza or red clover. Gains of steers grazing pastures interseeded with red clover or lespedeza were similar ($P > .05$). These results for gains of grazing stocker cattle followed the same trends as legume cover.

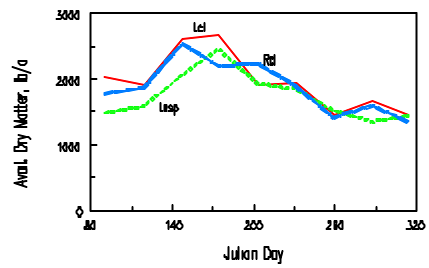

Figure 1. Available Forage in Tall Fescue Pastures, 1998, Southeast Agricultural Research Center.

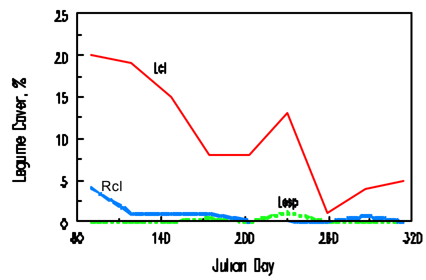

Figure 2. Legume Canopy Cover in Tall Fescue Pastures, 1998, Southeast Agricultural Research Center.

Table 1. Effects of Interseeding Legumes into Endophyte-Infected Fescue Pastures on Performance of Grazing Steers (223 Days), Southeast Agricultural Research Center, 1998.

	Legume		
Item	Lespedeza	Red Clover	Ladino Clover
No. of head	14	15	15
Initial wt., lb	572	574	573
Ending wt., lb	779[a]	803[a]	849[b]
Gain, lb	207[a]	230[a]	276[b]
Daily gain, lb	.93[a]	1.03[a]	1.24[b]

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

EFFECTS OF INTERSEEDING LESPEDEZA INTO CRABGRASS PASTURE ON FORAGE PRODUCTION AND CATTLE PERFORMANCE

Lyle W. Lomas, Joseph L. Moyer, Frank K. Brazle[1] and Gary L. Kilgore[2]

Summary

During the summer of 1998, 40 steers grazed 'Red River' crabgrass pastures that were fertilized with additional nitrogen or interseeded with lespedeza. Legume cover, forage dry matter production, grazing steer performance, and subsequent feedlot performance were measured. Available forage dry matter, grazing steer performance and subsequent finishing performance, and overall steer gains were similar between pastures of crabgrass fertilized with additional nitrogen and those interseeded with lespedeza.

Introduction

Cattlemen in southeastern Kansas, eastern Oklahoma, and western Arkansas need high quality forages to complement grazing of tall fescue. Complementary forages are needed especially during the summer months when fescue forage production declines and animal performance is reduced by the endophyte that typically is found in most fescue grown in this area. Crabgrass could fill this niche by providing high-quality forage for summer grazing. A high level of nitrogen (N) fertilization is required for crabgrass, but adding a legume such as lespedeza could reduce N level, enhance the utilization of crabgrass, and extend grazing of high quality forage in late summer. The purpose of this study was to evaluate the effect of interseeding lespedeza into crabgrass pastures on forage availability, grazing stocker steer performance, and subsequent feedlot performance.

Experimental Procedures

Pastures

Korean lespedeza was seeded in mid-April of 1998 at the rate of 15 lb per acre on five of 10 4-acre pastures that had been seeded with Red River crabgrass during the summer of 1997. An additional 2 lb/a of crabgrass seed also was broadcast at this time on all pastures. The ground had been worked previously and planted to wheat in the fall of 1997 after the crabgrass had set seed. The wheat was cut for hay in mid May. All pastures received 50 lb N/a in late May at the time of crabgrass emergence and an additional 50 lb N/a was applied to pastures without lespedeza in early August. All pastures were clipped to a height of approximately 7 in. on July 6 and mowed for hay on August 17 to control weeds.

Available forage was determined at the initiation of grazing and during the season with a disk meter calibrated for crabgrass. One exclosure (15-20 sq ft) was placed in each pasture; total production was estimated 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.

Cattle

[1]Southeast Area Extension Livestock Specialist, Chanute.

[2]Southeast Area Extension Crops & Soils Specialist, Chanute.

Forty mixed-breed steers with an initial weight of 702 lb were weighed on consecutive days, stratified by weight, and allotted randomly to the 10 pastures on June 23, 1998. Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkeye. Steers had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt. All pastures were grazed continuously for 98 days at a stocking rate of one head/a until grazing was terminated, and steers were weighed on September 28 and 29.

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 for 142 days. Steers were implanted with Synovex S® on days 0 and 84 of the finishing period. Cattle were slaughtered in a commercial facility at the end of the finishing period, and carcass data collected.

Results and Discussion

Pastures

Available forage dry matter is presented in Figure 1. It was similar between pastures that received additional N fertilizer and those that were interseeded with lespedeza. Available forage dry matter decreased dramatically for both treatments after mid August following mowing for hay coupled with below normal precipitation. Legume coverages averaged 4.7% in pastures interseeded with lespedeza and 1.3% in those that received additional N fertilization. Legumes present in pastures that received additional N fertilization were primarily volunteer ladino clover.

Cattle Performance

Performances of steers that grazed crabgrass pastures fertilized with additional N and those interseeded with lespedeza are presented in Table 1. Grazing gains, subsequent feedlot performance, and overall performance were similar between pastures with lespedeza and those that received an extra application of N; grazing gains were 1.27 and 1.23 lb/head daily, respectively. Cattle should have been removed from pastures 2 weeks earlier to achieve maximum gains.

In future years, wheat will be planted in the fall and grazed out in the spring. Cattle then will graze crabgrass during the summer months. We are hopeful that the crabgrass will be able to reseed itself each year.

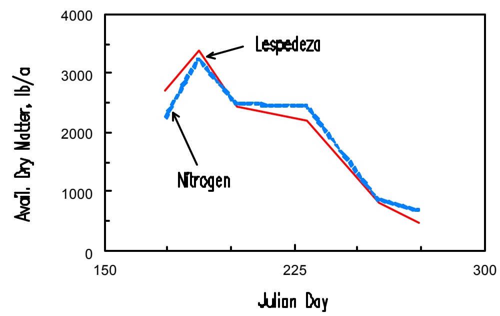

Figure 1. Available Forage in Crabgrass Pastures, 1998, Southeast Agricultural Research Center.

Table 1. Effects of Interseeding Lespedeza vs. Nitrogen Fertilization on Performance of Steers Grazing Crabgrass Pastures, Southeast Agricultural Research Center, 1998.

Item	Nitrogen Fertilization	Lespedeza
Grazing Phase (98 Days)		
No. of head	20	20
Initial wt., lb	702	702
Ending wt., lb	827	823
Gain, lb	124	121
Daily gain, lb	1.27	1.23
Finishing Phase (142 Days)		
Initial wt., lb	827	823
Final wt., lb	1253	1239
Gain, lb	426	416
Daily gain, lb	3.00	2.93
Daily DM intake, lb	26.3	26.9
Feed/gain	8.9	9.2
Hot carcass wt., lb	764	756
Backfat, in	.36	.34
Ribeye area, in^2	12.8	13.1
Yield grade	2.6	2.4
Marbling score	SM^{16}	SM^{43}
% Choice	65	75
Overall Performance (Grazing + Finishing Phase) (240 Days)		
Gain, lb	551	537
Daily gain, lb	2.30	2.24

USE OF LEGUMES IN SMALL GRAIN-BERMUDAGRASS PASTURES UNDER CONTINUOUS OR ROTATIONAL GRAZING

Joseph L. Moyer, Lyle W. Lomas, and Kenneth P. Coffey[1]

Summary

Grazing system of bermudagrass did not affect calf or cow gains, forage availability, or legume coverage.

Introduction

Bermudagrass [*Cynodon dactylon* (L.) Pers.] is a productive forage species when intensively managed. However, it has periods of dormancy and requires proper use to maintain forage quality and adequate nitrogen (N) fertilizer to optimize forage yield and quality. Interseeding wheat or other small grains can lengthen the grazing season but requires additional N fertilization. Legumes in the bermudagrass sward could improve forage quality and reduce fertilizer usage but are difficult to establish and maintain with the competitive grass. Rotational grazing could improve the chances of successfully maintaining legumes in the sward. This study was designed to compare effects of continuous and rotational grazing on cow and calf performance, forage availability, legume cover, and botanical composition of small grain-bermudagrass pastures interseeded with red and ladino clovers and lespedeza.

Experimental Procedures

'Hardie' bermudagrass pastures located at the Mound Valley Unit of the KSU - Southeast Agricultural Research Center (Parsons silt loam soil) were arranged into four 10-acre units. Two units each were managed as continuous or rotationally grazed systems in a completely randomized design (two replications).

Ninety lb/a of wheat was interseeded (no-till) into bermudagrass sod in September each year and fertilized in February with 55 lb/a of N. In March of 1996 and 1997, red clover, white (ladino) clover, and lespedeza were interseeded into each pasture.

Eight randomly assigned cow-calf pairs were weighed twice on successive days and placed on each 10-acre unit on April 7, 1998. Rotationally grazed units, initially 5-acre paddocks, were subdivided with each successive rotation until each of eight paddocks was being grazed for 3.5-day intervals. Continuously grazed pastures were maintained season-long in 10-acre units. On June 1, cows and calves were weighed, calves were weaned, and pastures were fertilized with 60-50-50 lb/a of N-P_2O_5-K_2O. Cows resumed grazing as before until September 1.

Available forage and legume canopy coverage were monitored throughout the grazing season with a calibrated disk meter.

Pastures were hayed each July to remove excess, low-quality forage and fertilized with 50 lb N/a. Cows were weighed on consecutive days in August prior to calving to determine total cow

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gain, and cows were removed from the pastures in early September.

Results and Discussion

Gain during the first grazing period (56 days) was the same (P>.10) for calves and for cows in the continuous and the rotational grazing systems (Table 1). Average available forage also was generally the same in both systems.

Cow gains during the second period and season-long were similar for the two grazing systems (Table 1). Excess forage that was removed as hay from the two systems was statistically similar (P>.10) but numerically higher for the rotational than the continuous grazing system.

Legumes constituted a similar amount of the dry matter in the pastures (P>.10) in the two systems, an average of 9% (Table 1). Red clover and white clover accounted for similar, high proportions of legume in the two systems.

Table 1. Effect of Continuous vs. Rotational Grazing Systems on Cow and Calf Performance, Hay Production, Average Available Forage, and Legume Canopy Coverage, Southeast Agricultural Research Center.

	Grazing System	
Item	Continuous	Rotational
Calf gain, lb/day	2.65	2.77
Cow gain, 1st period, lb/day	1.22	1.38
Cow gain, 2nd period, lb/day	1.17	1.04
Hay production, tons/a	0.64	1.54
Avail. forage, lb/a	3300	3560
Legume canopy coverage, %	10	8

ALFALFA VARIETY PERFORMANCE IN SOUTHEASTERN KANSAS

Joseph L. Moyer

Summary

A test of 18 alfalfa entries seeded in 1995 was cut five times in 1998. Yields ranged from 6.75 to 7.68 tons/a. For the year, ABI 9141 and 'Magnum IV' yielded significantly (P<.05) more than 'Kanza', DK 133, and 'Rushmore'. A 28-line test was established and harvested twice.

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

An 18-line test seeded (15 lb/a) on April 6, 1995 at the Mound Valley Unit was harvested five times in 1998. Plots were fertilized preplant, each subsequent spring, and after the first cutting in 1998 on May 14 with 21-54-182 lb/a of N-P_2O_5-K_2O. All entries were about 25% bloom at the first cutting and one-tenth bloom at the second, third, and fourth cuttings.

A transient swarm of blister beetles appeared just prior to the first cutting but soon dissipated. Moisture was adequate during most of the season, but the soil became dry by the fourth cutting. No regrowth occurred until September rains provided adequate moisture (see weather summary).

A 28-line test was seeded (15 lb/a) on April 14, 1998 at the Mound Valley Unit. The plot area was limed in February, fertilized with 30-72-240 lb/a of N-P_2O_5-K_2O, and treated preplant with 2.5 lb/a of benefin 60DF.

Results and Discussion

Cut 1 yields were significantly (P<.05) higher from 'Haygrazer' than from Kanza, 'Magnum IV' and six other entries (Table 1). Yields of the second cut were higher from ABI 9231 and Magnum IV than from six other entries. Differences were less distinct in cuts 3, and 4. In cut 5, yield of 'ABI 9141' was higher than yield of seven other entries.

For the year, ABI 9141 and 'Magnum IV' yielded significantly (P<.05) more than 'Kanza', DK 133, and 'Rushmore' (Table 2). Four-year total production was greater (P<.05) from ABI 9141, 'Total+Z', 'Supercuts', and TMF Generation than from Kanza, 'Riley', and Perry. ABI 9141 also produced more than 3T26 Exp., 'Rushmore', and two other entries.

The test seeded in 1998 was harvested on June 24 and July 24. Total yields ranged from 2.25 to 2.57 tons/a.

Table 1. Forage Yields (tons/a @ 12% moisture) of Five Cuttings in the Alfalfa Variety Test in 1998, Mound Valley Unit, Southeast Agricultural Research Center.

Source	Entry	5/13	6/4	7/8	8/6	10/22
AgriPro Biosciences, Inc.	ABI 9141	2.99b[a]	1.66abc	0.90ab	0.58ab	1.54a
AgriPro Biosciences, Inc.	SUPERCUTS	3.21ab	1.64abcd	0.69ab	0.53abcd	1.28d
AgriPro Biosciences, Inc.	ABI 9231 EXP	2.94bc	1.70a	0.76ab	0.56abc	1.36bcd
AgriPro Biosciences, Inc.	INNOVATOR + Z	3.10ab	1.60abcde	0.65ab	0.46bcd	1.50ab
AgriPro Biosciences, Inc.	TOTAL+Z	3.18ab	1.60abcde	0.74ab	0.48bcd	1.44abc
AgriPro Biosciences, Inc.	ZC 9346	3.13ab	1.60abcde	0.64ab	0.48bcd	1.37bcd
DEKALB Plant Genetics	DK 127	3.06abc	1.52cde	0.67ab	0.42bcd	1.43abc
DEKALB Plant Genetics	DK 133	2.98bc	1.52cde	0.67ab	0.46bcd	1.28d
Forage Genetics	3T26 EXP	2.99bc	1.65abc	0.64ab	0.48bcd	1.24d
Great Plains Research	HAYGRAZER	3.33a	1.48de	0.60b	0.42bcd	1.48ab
Mycogen Plant Sciences	TMF GENERATION	3.18ab	1.64abcd	0.64ab	0.48bcd	1.47ab
Northrup King Co.	RUSHMORE	2.98bc	1.52cde	0.67ab	0.47bcd	1.32cd
Ohlde Seed Co.	MAGNUM IV	2.80c	1.68ab	0.95a	0.69a	1.49ab
W-L Research, Inc.	WL 252 HQ	3.11ab	1.47e	0.74ab	0.50bcd	1.48ab
W-L Research, Inc.	WL 323	3.07abc	1.56abcde	0.71ab	0.55abc	1.45abc
Public-Nebraska AES	PERRY	3.15ab	1.48e	0.65ab	0.36d	1.50ab
Public-Kansas AES	KANZA	2.79c	1.54bcde	0.71ab	0.46bcd	1.26d
Public-Kansas AES	RILEY	3.03bc	1.53bcde	0.65ab	0.38cd	1.44abc
Average		3.06	1.58	0.70	0.49	1.41

[a]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 (tons/a @ 12% moisture) of the Alfalfa Variety Test, Mound Valley Unit, Southeast Agricultural Research Center.

Source	Entry	1995	1996	1997	1998	4-Year Total
AgriPro Biosciences, Inc.	ABI 9141	3.74	5.68	10.71	7.68	27.81
AgriPro Biosciences, Inc.	SUPERCUTS	3.94	5.66	10.33	7.34	27.28
AgriPro Biosciences, Inc.	ABI 9231 EXP	3.68	5.43	10.41	7.33	26.84
AgriPro Biosciences, Inc.	INNOVATOR + Z	3.88	5.24	9.76	7.30	26.18
AgriPro Biosciences, Inc.	TOTAL+Z	3.65	5.99	10.33	7.44	27.42
AgriPro Biosciences, Inc.	ZC 9346	3.59	5.49	10.36	7.21	26.64
DEKALB Plant Genetics	DK 127	3.50	5.14	10.08	7.10	25.82
DEKALB Plant Genetics	DK 133	3.72	5.79	10.06	6.90	26.48
Forage Genetics	3T26 EXP	3.65	5.22	9.75	7.01	25.64
Great Plains Research	HAYGRAZER	3.25	5.48	10.30	7.31	26.34
Mycogen Plant Sciences	TMF GENERATION	3.54	5.60	10.57	7.41	27.12
Northrup King Co.	RUSHMORE	3.48	5.46	9.80	6.96	25.70
Ohlde Seed Co.	MAGNUM IV	3.12	5.90	10.22	7.62	26.85
W-L Research, Inc.	WL 252 HQ	3.47	5.48	10.12	7.30	26.38
W-L Research, Inc.	WL 323	3.67	5.58	9.86	7.33	26.44
Public-Nebraska AES	PERRY	3.13	5.39	9.70	7.13	25.34
Public-Kansas AES	KANZA	2.89	5.55	9.54	6.75	24.73
Public-Kansas AES	RILEY	2.91	5.37	9.91	7.04	25.23
Average		3.49	5.52	10.10	7.23	26.35
LSD(.05)		0.49	NS	0.67	0.63	1.29

PERFORMANCE OF WARM-SEASON, PERENNIAL, FORAGE GRASSES

Joseph L. Moyer and Kenneth W. Kelley

Summary

A test of warm-season, perennial grasses seeded in spring, 1996 was harvested for forage production on July 23, 1997. Production averaged 3.54 tons/acre. ‘WW Ironmaster’ Old World bluestem and ‘Kanlow’ switchgrass produced more forage than PI-483446 big bluestem and ‘Blackwell’ switchgrass. Stands of ‘Pete’ and 2745 eastern gamagrasses were poor.

Introduction

Warm-season, perennial grasses can be used to fill a production void in forage systems left by cool-season grasses. Reseeding improved varieties of certain native species, such as big bluestem, switchgrass, and Indiangrass, could help fill that summer production "gap". Certain introduced, warm-season grasses, such as the so-called Old World bluestems (*Bothriochloa* species), have as much forage potential as big bluestem and are easier to establish but may lack some quality characteristics.

Experimental Procedures

Warm-season grass plots (30 ft x 5 ft) were seeded with a cone planter in 10-inch rows on May 22, 1996 at the Parsons Unit, Southeast Agricultural Research Center. Fifty lb/a of diammonium phosphate (18-46-0) were applied with the seed material to facilitate movement through the planter. Big bluestem entries were seeded at 10 lb pure, live seed (PLS)/a. Indiangrass and switchgrasses were seeded at 8 lb and 5 lb PLS/a, respectively. ‘Pete’ eastern gamagrass was seeded with 10 lb material/a. The previous entries were obtained from the USDA-NRCS Plant Materials Center in Manhattan. The two Woodward (WW) entries, 'WW Ironmaster' and WW 2745, were obtained from Dr. Chet Dewald, USDA Southern Plains Station, and seeded at 5 lb material/a. The plot area was clipped to control weeds in 1996 and burned in April of 1997 and 1998. Plots were fertilized with 60 lb N/a on April 23. A 20 ft x 3 ft area was harvested July 16, 1998 with a Carter flail harvester at a height of 2-3 inches, and the remainder of the area was clipped.

Results and Discussion

Forage yields from the warm-season cultivar test are shown in Table 1. Stands were generally satisfactory except for eastern gamagrass entries. Much of the forage harvested from plots seeded with eastern gamagrass thus consisted of weedy grass species.

Forage production in 1998 averaged 3.27 tons/a and 3.65 tons/a without the eastern gamagrass entries (Table 1). ‘Kanlow’ switchgrass produced more forage than any other entry. ‘Kaw’ big bluestem produced more than ‘WW Ironmaster’ Old World bluestem, ‘Osage’ Indiangrass, and ‘Blackwell’ switchgrass, with PI -483446 big bluestem being intermediate.

Table 1. Forage Yield of Warm-Season Grass Cultivars in 1998, Parsons Unit, Southeast Agricultural Research Center.

Cultivar	Species	Forage Yield
		tons/a@12% moisture
WW Ironmaster	Old World bluestem	3.25
Kanlow	Switchgrass	4.70
Blackwell	Switchgrass	3.35
Osage	Indiangrass	3.28
Kaw	Big bluestem	3.82
PI-483446	Big bluestem	3.56
Pete[1]	Eastern gamagrass	1.81
2745[1]	Eastern gamagrass	1.99
LSD(.05)		0.38

[1]Poor stand; much of the forage composed of weedy species.

EFFECTS OF NITROGEN RATE AND PLACEMENT ON EASTERN GAMAGRASS UNDER 1-CUT OR 2-CUT HARVEST SYSTEMS

Joseph L. Moyer and Daniel W. Sweeney

Summary

Yield was increased by 60% from the first 45 lb/a increment of nitrogen (N) application and 41% with the next 45 lb. Knifing N resulted in no increase in total yield in 1998 but produced higher yields than broadcast application in the second cutting of the 2-cut system. One-cut and 2-cut harvest systems responded similarly.

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 nitrogen (N) and more harvests. This study was established to determine the response of eastern gamagrass to N fertilizer rates and placement under 1-cut or 2-cut harvest systems.

Experimental Procedures

Established (15-year-old) 'Pete' eastern gamagrass was fertilized with 54 lb P_2O_5/a and 61 lb K_2O/a in each of the past 6 years and burned each spring except in 1996. In 1992-1994, N (urea-ammonium nitrate, 28% N) treatments of 45, or 90 lb/a were applied in late April to 8ft by 20ft plots by broadcast or knife (4-inch) placement. Control plots received no N but were knifed. Nitrogen was not applied in 1995-1997, so that residual responses could be tested. In 1998, N treatments were applied on April 23 to the same plots in the same manner as in 1992-94.

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

Results and Discussion

Total yields in 1998 were increased ($P<.05$) by 60% with the first 45 lb/a increment of previous N and by an additional 41% with the next 45-lb increment (Table 1).

Nitrogen placement affected yield ($P<.05$) only in the second cutting of the 2-cut system. However, interactions were found for yield between N rate and placement factors in the 2-cut system. In the first cutting, knifing with no N reduced yield by 18%, but knifing N at the 45 lb /a rate increased yield by 9% compared to broadcasting the same amount, and knifing increased yield by 12% over broadcast when 90 lb N/a was applied.

Table 1. Eastern Gamagrass Forage Yields in 1998 under Two Harvest Systems with Different Nitrogen Rates and Placements, Southeast Agricultural Research Center.

Harvest System	Rate	Nitrogen Placement	Nitrogen Cut 1	Cut 2	Forage Yield Total		
		lb/a			- - - - - tons/a (12% moisture) - - - - -		
Means, Nitrogen Placement							
1-Cut			Broadcast		2.06	-	2.06
			Knife		1.94	-	1.94
				LSD(.05)	NS	-	NS
2-Cut			Broadcast		1.54	0.34	1.88
			Knife		1.61	0.41	2.01
				LSD(.05)	NS[1]	0.06	NS[1]
Overall		Broadcast			1.97		
			Knife				1.98
				LSD(.05)			NS
Means, Nitrogen Rate							
1-Cut	0				1.15	-	1.15
	45				2.06	-	2.06
	90				2.79	-	2.79
		LSD(.05)			0.29	-	0.29
2-Cut	0				0.96	0.32	1.28
	45				1.51	0.33	1.85
	90				2.25	0.46	2.72
		LSD(.05)			0.17[1]	0.08[1]	0.24[1]
Overall	0					1.22	
	45						1.95
	90						2.76
		LSD(.05)					0.17
Means, Harvest System							
1-Cut							2.00
2-Cut							1.95
LSD(.05)							NS

HAY PRODUCTION OF WARM-SEASON ANNUAL GRASSES

Joseph L. Moyer

Summary

Sudan-type grasses were evaluated from three cuttings for hay production and quality. Twenty-nine entries, including three millets, were evaluated for yield, crude protein content, leaf:stem ratio, and fiber contents. Millets yielded about 67% as much as sorghum-sudans, but first-cut forage had 173% greater leaf:stem ratio and more than 3 percentage points higher crude protein content. Differences for each trait were found within each species group.

Introduction

A hay test of warm-season annuals, which included yield and quality evaluations, was offered in 1998 for commercial entrants on a fee basis. Check and/or public lines were added to the 26 commercial entries to make 29 entries, three of them millets.

Experimental Procedures

The test was seeded in 30ft by 5ft (six 10-in rows) plots at the rate of 450,000 live seeds/a, replicated four times in a randomized complete block on May 14, 1998 at the Mound Valley Unit. Plots were fertilized preplant with 130-70-230 lb/a of N-P_2O_5-K_2O, and with 60 lb/a of N after the first cut. Three harvests were obtained, on 29 June, 27 July, and 12 October. The first harvest was from early boot to the head emergence stage. Growing conditions (see weather summary) were dry by late August. No particular insect or disease problems were noted.

Results and Discussion

Forage yields of each of the three cuttings and total 1998 production are shown in Table 1. In Cut 1, 'Trudan 8', 'Grazex II', 'Grazex IIw', and X25477 produced more forage than 10 other sudan and sorghum types and the three millets.

Second-cut yields were significantly better for 'ReGro H-22B' and Trudan 8 than for eight other sorghum types and the three millets. In Cut 3, five sorghum crosses yielded more than the three millets, four sudans, and eight sorghum crosses. Annual yield was significantly higher for Grazex IIw, Grazex and Re-Gro H22B than for the three millets and for 16 other sudans and sorghum crosses.

Table 2 shows leaf:stem ratios of Cut 1 forage. The three millet cultivars had significantly greater leaf:stem ratio than all but the two Tift experimentals. The millet with the highest leaf:stem ratio yielded less ($P<.05$) than all but eight sudan and sorghum crosses, however.

Table 2 also shows crude protein concentrations of forage from Cuts 1 and 2. Crude protein (CP) concentrations of first-cut forage of the three millets and two Tift experimentals were higher ($P<.05$) than those of all other entries. As a group, the millets averaged 14.2% CP for first-cut forage. The other cultivars of the sorghum types ranged from 11.5 to 8.3% crude protein. 'Georgia 337', EX 8, BMR Exp., and 'Greenleaf' had higher first-cut forage CP than five other entries. In Cut 2, forage of the three millets and two Tift experimentals had higher (P<.05) CP than forage of 13 other entries.

Table 1. Forage Yield of Summer Annual Grasses Grown for Hay in 1998, Mound Valley Unit, Southeast Agricultural Research Center.

			Forage Yield			
Source/Brand	Entry	Type	Cut 1	Cut 2	Cut 3	Total
			- - - - - tons/a @ 12% moisture - - - - -			
Golden Harvest	Re-Gro H-22B	SX	3.38	1.92	3.76	9.05
	GH EX 5	SX	2.50	1.11	2.83	6.44
	GH EX 6	SX	2.09	1.21	2.91	6.20
	GH EX 7	SX	2.00	1.37	3.23	6.59
	GH EX 8	SX	2.65	1.68	3.26	7.58
Triumph	Sooner Sweet	SX	2.91	1.52	3.32	7.75
	Super Sweet10	SX	2.44	1.73	3.48	7.65
	Super Mil 60	M	1.88	1.00	1.60	4.48
Novartis	Trudan 10	S	3.00	1.73	3.25	7.98
	Trudan 8	S	3.63	1.77	3.10	8.50
Mycogen Seed	T-E Haygrazer	SX	3.15	1.75	3.08	7.98
Dekalb	SX-8	SX	3.25	1.46	3.05	7.75
	ST6 E	SX	3.08	1.59	3.54	8.20
	SX-17	SX	3.24	1.70	3.55	8.49
Cargill	X25477	SX	3.47	1.34	3.29	8.09
	X18347	SX	3.12	1.44	3.72	8.28
Seed Resource	Exp S-96-3	SX	3.22	1.48	3.56	8.25
	Exp M-97-1	M	1.83	1.08	1.80	4.71
Sharp Bros.	Buffalo Brand	SX	3.11	1.55	3.83	8.49
	Grazex II	SX	3.57	1.66	4.02	9.25
	Grazex II w	SX	3.61	1.74	3.95	9.30
	BMR Exp.	SX	2.31	1.04	2.75	6.10
Wayne Hanna	Tift Exp. #4	SX	2.57	0.85	2.86	5.78
	Tift Exp. #5	SX	2.29	0.93	1.84	5.05
	Ga 337	S	1.93	1.15	2.03	5.12
	Tifleaf 3	M	1.99	0.97	1.76	4.72
Check	Piper	S	2.78	1.50	2.33	6.61
	NB 280S	SX	3.07	1.71	2.56	7.34
	Greenleaf	S	2.65	1.51	2.64	6.79
Average			2.78	1.43	2.99	7.19
LSD(0.05)			0.66	0.32	0.54	0.91

Table 2. Forage Quality of Summer Annual Grasses Grown for Hay in 1998, Mound Valley Unit, Southeast Branch Experiment Station.

Source/Brand	Entry	Type	Cut 1 Leaf:Stem	Crude Protein	
				Cut 1[a]	Cut 2
				- - - - % - - - -	
Golden Harvest	Re-Gro H-22B	SX	0.84	10.1	14.5
	GH EX 5	SX	1.02	10.8	15.7
	GH EX 6	SX	0.86	10.0	15.9
	GH EX 7	SX	1.05	10.6	15.5
	GH EX 8	SX	1.32	11.2	13.9
Triumph	Sooner Sweet	SX	0.73	9.6	15.0
	Super Sweet10	SX	0.96	9.5	14.2
	Super Mil 60	M	2.74	14.6	16.7
Novartis	Trudan 10	S	0.76	9.9	14.0
	Trudan 8	S	0.65	8.3	14.4
Mycogen Seed	T-E Haygrazer	SX	0.66	8.4	13.0
Dekalb	SX-8	SX	0.79	9.9	14.0
	ST6 E	SX	0.77	8.9	14.2
	SX-17	SX	0.83	9.9	13.9
Cargill	X25477	SX	0.77	9.0	13.7
	X18347	SX	1.24	9.8	14.9
Seed Resource	Exp S-96-3	SX	0.67	9.0	15.3
	Exp M-97-1	M	3.05	14.3	17.4
Sharp Bros.	Buffalo Brand	SX	0.72	9.5	15.7
	Grazex II	SX	0.80	9.8	14.9
	Grazex II w	SX	0.73	9.9	14.6
	BMR Exp.	SX	0.88	11.0	16.4
Wayne Hanna	Tift Exp. #4	SX	2.09	14.2	17.8
	Tift Exp. #5	SX	2.34	13.6	18.1
	Ga 337	S	1.02	11.5	15.7
	Tifleaf 3	M	2.60	13.6	18.2
Check	Piper	S	0.59	9.2	15.3
	NB 280S	SX	0.72	10.2	15.8
	Greenleaf	S	0.97	11.0	15.1
Average			1.15	10.6	15.3
LSD(0.05)			0.57	1.6	1.4

[a]All entries were between the boot and head emergence stages of growth.

PERFORMANCE TEST OF ENSILAGE-TYPE SORGHUM

Joseph L. Moyer

Summary

Sorghums were evaluated for ensilage production and agronomic characteristics. Seventeen entries were evaluated for yield (ensilage and grain), maturity, height, and lodging. Yields (30% DM) ranged from about 17 to 40 tons/a. Grain in the ensilage ranged from 11 to almost 100 bu/a.

Introduction

A test of forage sorghums was offered at three locations from 1994-96. Since that time, some new hybrids have been developed. This evaluation was offered in 1998 for commercial entrants on a fee basis to provide an unbiased comparison among commercial entries and some older cultivars. Check and/or public lines were added to the 13 commercial entries to make 17 entries.

Experimental Procedures

The test was seeded in two 30-inch rows at the rate of about 100,000 live seeds/a, replicated four times in a randomized complete block on 14 May, 1998 at the Mound Valley Unit. Plots were fertilized preplant with 130-70-240 lb/a of N-P_2O_5-K_2O. Plots were thinned to about 35,000 plants/a in early June.

Both rows were harvested on 29 Sept. Heads were harvested from one row, dried, and threshed for determination of grain yield. Growing conditions (see weather summary) were dry from late July to early September. No particular insect or disease problems were noted.

Results and Discussion

Ensilage yields and moisture content are shown in Table 1. Two experimental entries, F-87-2 and X24442, produced more ensilage than the other sorghums. A commercial entry, ‘Super Sile 20', produced more ensilage than all but one other entry. However, dry matter content and grain yield were both relatively low for the two top ensilage-producing hybrids. Grain yields were higher for X-488 and FS 22 than for the other cultivars.

Heights were generally less in 1998 than in previous years. The taller hybrids tended to yield more, but did not necessarily lodge more than short types. Two cultivars with the most serious lodging problem were less than 75 inches in height, whereas the two highest-yielding hybrids were tallest but were below-average in lodging percentage. Two of the shorter hybrids, NK 300 and Milk-A-Lot, showed practically no lodging but produced an above-average amount of ensilage and significantly more grain than the leading ensilage- producing hybrids.

Table 1. Yield and Agronomic Characteristics of Sorghums Grown for Ensilage in 1998, Mound Valley Unit, Southeast Agricultural Research Center.

Source/Brand	Entry	Ensilage Yield	Ensilage DM	Grain Yield	Days to Half-Bloom[c]	Plant Popul.	Plant Ht.	Lodging
		tons/a[a]	%	bu/a[b]		No./a	in	%
Triumph Seed	Super Sile 20	35.0	27.8	50	105	62400	99	5
Novartis Seed	NK300	27.1	32.8	60	90	54670	55	0
Mycogen Seed	T-E Milk-A-Lot	26.4	34.1	48	90	51950	52	2
Mycogen Seed	T-E Silomaker	29.6	29.9	44	91	53690	66	6
Dekalb	FS-22	19.3	32.6	87	67	46940	51	2
Dekalb	X-488	21.7	36.3	96	68	48243	51	2
Cargill	X43024	32.0	30.8	37	98	57170	60	2
Cargill	X24442	39.1	29.9	29	109	60330	76	6
Seed Resource	Exp F-87-2	40.3	25.1	17	- -[d]	55650	102	45
Seed Resource	Exp F-97-1	17.9	28.7	34	69	45055	74	2
Sharp Bros.	Canex	22.2	30.8	50	61	53143	64	2
Sharp Bros.	Canex II	21.9	31.4	64	65	54340	71	6
Sharp Bros.	BMR Experimental	17.2	34.3	51	67	43451	64	36
Timken Seed	Atlas	24.5	25.4	11	80	56190	82	4
Timken Seed	Rox Orange	21.4	31.8	54	65	55970	66	11
Timken Seed	Early Sumac	20.1	28.6	48	62	56740	63	21
Timken Seed	Sugar Drip	26.0	30.4	27	76	58370	89	10
	LSD(.05)	3.8	2.8	18	3	7740	4	10

[a]Ensilage yields expressed on the basis of 30% dry matter.
[b]Grain yields expressed on the basis of 12.5% moisture, 56 lb/bu test weight.
[c]Days after planting on May 14.
[d]Did not achieve 50% bloom prior to harvest

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

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

Summary

In 1998, irrigation at the R1 growth stage tended to result in yield about 10% higher than yield without irrigation, but irrigation at R3 did not increase popcorn yields. Increasing plant populations from 15,000 to 25,000/a also increased yield by about 10%.

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. Even though large irrigation sources such as aquifers are lacking in southeastern Kansas, supplemental irrigation could be supplied from the substantial number of small lakes and ponds in the area. 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: 1) no irrigation, 2) 1 in. at R1 (silk), 3) 2 in. at R1, 4) 1 in. at R3 (milk), 5) 2 in. at R3, and 6) 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 12, 1998 and thinned to the desired populations on June 2. Plots were harvested on September 1.

Results and Discussion

Overall popcorn yields averaged more than 2000 lb/a in 1998 (data not shown). Irrigation at the R1 growth stage (silk) tended to increase yields by about 10% compared to no irrigation, but irrigation at R3 (milk) had no effect on popcorn yields. Increasing plant populations from 15,000 to 25,000/a also resulted in about 10% greater yield.

[1] Department of Horticulture, Forestry and Recreation Resources, KSU.

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

Daniel W. Sweeney

Summary

In 1998, the sixteenth cropping year of a grain sorghum-soybean rotation, tillage and residual N management systems did not affect soybean yields. Long-term average yields also are unaffected by these management options.

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 odd-year grain sorghum crops from 1983 to 1997 were a) no N (check), b) anhydrous ammonia knifed to a depth of 6 in., 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

Similar to the long-term average, 1998 soybean yields were unaffected by tillage or the residual from N fertilization applied to the grain sorghum crop in the previous year (Table 1).

Table 1. Effects of Tillage and Nitrogen Fertilization on Yield of Soybean Grown in Rotation with Grain Sorghum, Southeast Agricultural Research Center.

	Yield	
Treatment	1998	Avg. 1984-1998
	-------------------- bu/a --------------------	
Tillage		
Conventional	25.0	24.7
Reduced	25.8	24.7
No tillage	26.0	24.9
LSD $_{(0.05)}$	NS	NS
N Fertilization		
Check	25.4	24.6
Anhydrous NH_3	26.2	25.2
UAN broadcast	24.8	24.0
Urea broadcast	25.9	25.1
LSD $_{(0.05)}$	NS	NS
T x N Interaction	NS	NS

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

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

Summary

In 1998, at 30 lb N/a, knife application and ridge tillage resulted in greater short-season corn yield. However, as N rates were increased, yield tended to be greater with broadcast applications but with less difference between tillage systems

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 design was a split-plot arrangement of a randomized complete block with four replications, with tillage systems as whole plots and N fertilizer management as subplots. Tillage systems were ridge and no tillage. The N fertilizer management subplot treatments were arranged as a 3x5 factorial including 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 and continued in 1997 and 1998. Short-season corn was planted on April 11, 1996, April 23, 1997, and April 17, 1998.

Results and Discussion

In 1998, the effect of N rate on short-season corn yield interacted with N placement and also with tillage system. At 30 lb N/a, knife application resulted in greater yield than either broadcast or dribble applications (Table 1). However, with 90 lb N/a, greater yield was obtained when the fertilizer was broadcast. At 30 lb N/a, greater yield was obtained in the ridge tillage system than with no tillage (Table 2). With ridge tillage, short-season corn yield was not increased by N rates greater than 60 lb/a. However, with no tillage, 120 lb N/a resulted in greater yields than N rates of 60 lb/a or less.

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

[2] Department of Plant Pathology, KSU.

Table 1. Effect of N Rate and Placement on Yield of Short-Season Corn in 1998, Southeast Agricultural Research Center.

	Yield		
N Rate	Broadcast	Dribble	Knife
lb/a	---- bu/a ----		
0	24.5	26.3	30.5
30	45.9	45.8	63.5
60	67.0	69.5	71.3
90	82.1	73.0	68.1
120	77.7	77.1	72.0

$LSD_{(0.05)}$ = 11.5 bu/a.

Table 2. Effect of N Rate and Tillage on Yield of Short-Season Corn in 1998, Southeast Agricultural Research Center.

	Yield	
N Rate	No Tillage	Ridge Tillage
lb/a	---- bu/a ----	
0	24.1	30.1
30	45.3	58.2
60	67.0	71.6
90	71.5	77.3
120	79.3	71.9

$LSD_{(0.05)}$ = 9.5 bu/a.

MANAGEMENT OF PHOSPHORUS-STRATIFIED SOIL FOR EARLY-SEASON CORN PRODUCTION[1]

Daniel W. Sweeney, Greg J. Schwab[2], and David A. Whitney[2]

Summary

In 1998 at two sites, short-season corn yield was little affected by soil P stratification, tillage, or P fertilizer placement.

Introduction

Phosphorus (P) stratification in soils in reduced- or no-tillage cropping systems has been well documented. If dry conditions occur during the summer, P uptake from the surface few inches can be limited. This can be alleviated by redistribution of the stratified P or by subsurface placement of additional fertilizer P. The objective of this study was to determine the effectiveness of tillage and/or P placement to alleviate the effects of P stratification in soil on short-season corn grown with no tillage.

Experimental Procedures

Two adjacent sites were established for this study. Site 1 was backgrounded with a soybean crop in 1996 followed in 1997 and 1998 with the short-season corn experiment; site 2 was backgrounded in 1997 and followed in 1998 with short-season corn. Stratified or nonstratified areas were established prior to planting the background soybean crop. This was accomplished by applying P fertilizer and incorporating by chisel, disk (deep), and field cultivation for the unstratified profile or only incorporating to a depth of 2 in. with a field cultivator for the stratified profile. These main plots were subdivided in 1997 for Site 1 and in 1998 for Site 2 by tillage (chisel/disk and no tillage), and sub-subplots were P placement methods (no P, broadcast 40 lb P_2O_5/a, and knife 40 lb P_2O_5/a at 4 in.). Corn was planted on April 24, 1997 and April 22, 1998.

Results and Discussion

In 1998 at Site 1, short-season corn yield averaged about 78 bu/a and was unaffected by stratification, tillage, or P fertilization (data not shown). At Site 2, average corn yield was 91 bu/a and was affected by an unexplainable interaction resulting from lower yield from broadcast application of P when the soil was stratified than obtained with knife application or even no P fertilizer. Little difference in yield was observed otherwise.

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

[2] Department of Agronomy, KSU.

TIMING OF NITROGEN, PHOSPHORUS, AND POTASSIUM FERTILIZATION FOR WHEAT AND DOUBLE-CROP SOYBEAN IN REDUCED AND NO-TILLAGE SYSTEMS

Daniel W. Sweeney

Summary

Delaying all phosphorus and potassium (P-K) fertilizer to late winter reduced wheat yields in 1998. Double-crop soybean yields were affected only by tillage. Because of replanting, no tillage resulted in lower yields than reduced tillage.

Introduction

Double-cropping soybean after wheat is practiced by many producers in southeastern Kansas. Typically, phosphorus (P) and potassium (K) fertilizers are applied in the fall prior to wheat planting, with no additional application prior to planting double-crop soybean. Nitrogen (N) is applied either in the fall or spring or at both times. Moreover, as the acreage of conservation tillage increases either as reduced- or no-till, management of fertilizer nutrients becomes more crucial. Timing of N, P, and K fertilization may not only impact wheat production but also affect yields of the following double-crop soybean. The objective of this study was to determine the effects of fall and late winter applications of N, P, and K for wheat followed by double-crop soybean grown in reduced- and no-tillage systems.

Experimental Procedures

The experiment was established in 1997 as a split-plot design with three replications. Whole plots were reduced tillage and no tillage. The 3x3 factorial arrangement of the subplots included three N and three P-K fertilizations applied all in the fall, all in late winter, or split evenly between fall and late winter. For each treatment, total fertilizer nutrients applied were 80 lb N/a, 70 lb P_2O_5/a, and 75 lb K_20/a. For reference, a check plot receiving no N, P, or K fertilization was included in each whole plot.

Results and Discussion

In 1998, wheat yield was increased by more than 20 bu/a with fertilization (data not shown.) Wheat yields were lower when all P-K was delayed until late winter in the no-till system, but no differences occurred in the reduced-tillage system. Wheat yield was unaffected by timing of N fertilization. Double-crop soybean yields were about 7 bu/a less with no tillage, likely because of a poor initial stand and replanting about 2 weeks later than in the reduced system. Double-crop soybeans were unaffected by the timing of N-P-K fertilization applied to the wheat crop.

EFFECTS OF PREVIOUS CROPPING SYSTEMS AND FERTILIZER NITROGEN ON GRAIN YIELD OF SUBSEQUENT CROPS

Kenneth W. Kelley and Joseph L. Moyer

Summary

Where no fertilizer N was applied, both corn and grain sorghum yields were influenced significantly by previous wheat double-crop and summer-fallow treatments. Grain yields were highest following sweet clover and the summer-fallow (herbicide) treatment and lowest following double-cropped grain sorghum and double-cropped soybean. However, when fertilizer nitrogen (125 lb N/a) was applied, corn and grain sorghum yields were similar among previous cropping systems, except where corn followed double-cropped grain sorghum. Previous wheat cropping system did not have a significant effect on soybean grain yield. Fertilizer N increased soybean grain yield only slightly (3 bu/a). In the second year of the crop rotation, wheat grain yields were similar following corn, grain sorghum, and soybean where fertilizer N (28% UAN) was knifed below crop residues. Previous wheat double-cropping systems had no significant effect on wheat yields.

Introduction

In southeastern Kansas, producers typically plant double-cropped soybean following wheat, although other crops, such as grain sorghum or sunflowers, sometimes are planted after wheat. However, other wheat cropping options can include planting a legume crop, such as sweet clover, in wheat in early spring to improve soil quality or summer-fallowing after wheat harvest, which likely will include mechanical tillage or the use of herbicides to control weeds during the summer. This research seeks to determine the influence of previous wheat double-crop and wheat summer-fallow systems on grain yield of subsequent spring crops (corn, grain sorghum, and soybean) and possible residual double-crop rotation effects on wheat yield in the second year of the crop rotation.

Experimental Procedures

In 1996, six cropping systems were established at the Parsons Unit, which included three crops (soybean, grain sorghum, and sunflower) planted no-till after wheat harvest; two wheat summer-fallow treatments (disk tillage versus herbicide only); and one legume crop (white sweet clover) interseeded in wheat in early spring. Roundup herbicide was used to control weeds in the summer-fallow treatment. Double-cropped grain sorghum and sunflowers each received 75 lb/a of fertilizer nitrogen (N) as broadcast ammonium nitrate. In 1997, corn, grain sorghum, and soybeans were planted with conventional tillage in each of the six previous wheat cropping systems. A fertilizer nitrogen variable (no N versus 125 lb N/a) also was included for each spring crop. Fertilizer N (28% urea-ammonium nitrate, UAN) was applied preplant at a depth of 4 to 6 in. with a coulter-knife applicator. In the fall, wheat was planted with conventional disk tillage following corn, grain sorghum, and soybean harvests. Fertilizer N (UAN) was applied preplant with the coulter-knife applicator at 125 lb N/a, or no application was made. Phosphorus and K fertilizers were broadcast applied and incorporated with tillage prior to the planting of spring crops and wheat in the fall.

Result and Discussion

Where no fertilizer N was applied, both corn and grain sorghum yields were influenced significantly by previous wheat double-crop and summer-fallow treatments (Table 1). Grain yields were highest following sweet clover and the summer-fallow (herbicide) treatment and lowest following double-cropped grain sorghum and double-cropped soybean. However, when fertilizer N (125 lb N/a) was applied, corn and grain sorghum yields were similar among previous cropping systems, except where corn followed double-cropped grain sorghum. Plant N analyses (data not shown) indicated that grain yields were influenced largely by differences in plant and soil N availabilities following the previous wheat cropping systems. Soil samples taken in early spring prior to corn planting showed that residual soil nitrate-N levels were relatively low (less than 20 lbs/a) for all previous wheat cropping systems. However, the highest grain yield and plant N following sweet clover and for the chemical fallow treatment suggest that significant amounts of residual soil N or mineralized plant N were present in the organic fraction of the soil, which became available for plant uptake later in the growing season. Results also indicated that when corn or grain sorghum followed wheat and double-cropped grain sorghum, the fertilizer N requirement was higher than for the other wheat cropping systems, probably because significant amounts of both fertilizer N and soil N were immobilized in the decomposing plant residues and unavailable for plant uptake.

Previous wheat cropping system did not have a significant effect on soybean grain yield. Fertilizer N increased soybean grain yield only slightly (3 bu/a).

In 1998, where no fertilizer N was applied, wheat grain yield also was influenced significantly by previous corn, grain sorghum, and soybean crops (Table 2). Grain yields were highest following soybean and lowest following grain sorghum, suggesting that any residual soil N likely was being immobilized to a greater extent following grain sorghum compared to soybeans and corn. However, when fertilizer N (125 lb N/a) was knifed below crop residues, wheat yields were similar among previous crops, indicating that fertilizer N efficiency was increased significantly by placement. Some research studies have shown that previous crop residues can result in early stunting of seedling growth because of an allelopathic effect; however, this effect was not observed in 1997.

Wheat yields were not affected significantly by any of the previous wheat double-crop systems that preceded the full-season summer crops (corn, grain sorghum, and soybean). This study will be continued for three complete cropping cycles to further evaluate residual rotation effects on subsequent crop yield.

Table 1. Effects of Previous Wheat Cropping Systems and Fertilizer Nitrogen on Grain Yield of Subsequent Corn, Sorghum, and Soybean Crops, Parsons Unit, Southeast Agricultural Research Center, 1997.

Previous Wheat	Corn Yield		Sorghum Yield		Soybean Yield	
Cropping System	No N	125 N	No N	125 N	No N	125 N
	------ bu/a ------		------ bu/a ------		------ bu/a ------	
Wh-Chemical fallow	118.8	168.3	120.4	134.2	50.6	52.8
Wh-Tillage fallow	95.5	157.9	104.4	132.3	48.3	50.7
Wh-Sweet clover	147.2	166.2	116.7	138.0	50.2	53.3
Wh-Grain sorghum	72.8	147.8	75.5	132.3	46.7	50.2
Wh-Soybean	86.8	165.6	87.3	141.1	47.4	50.1
Wh-Sunflower	97.0	160.5	101.9	137.5	48.7	51.6
Avg*	101.9[b]	161.1[a]	101.0[b]	135.9[a]	48.7[b]	51.4[a]

LSD (0.05):
Comparing subplot N treatments within same previous crop:
corn = 13.0 bu/a; sorghum = 10.3 bu/a; soybean = NS.
Comparing subplot N treatments for different previous crop:
corn = 14.2 bu/a; sorghum = 10.9 bu/a; soybean = NS.

* Fertilizer N means of same previous crop followed by a different letter are significant at the 5% level of probability;
NS = not significant at the 5% level of probability.
Fertilizer N (28% UAN) applied at a depth of 4 to 6 in. with a coulter-knife applicator.

Table 2. Effects of Previous Cropping Systems and Fertilizer Nitrogen on Grain Yield of Winter Wheat, Parsons Unit, Southeast Agricultural Research Center, 1998.

Previous Wheat Cropping System	Wheat Yield Following					
	Corn		Grain Sorghum		Soybean	
	No N	125 N	No N	125 N	No N	125 N
	bu/a					
Wh-Chemical fallow	14.6	61.5	9.1	60.1	25.9	59.5
Wh-Tillage fallow	17.6	58.6	10.1	56.9	20.4	62.0
Wh-Sweet clover	16.9	59.6	10.3	60.1	24.1	59.8
Wh-Grain sorghum	16.6	58.6	11.0	59.3	22.9	59.6
Wh-Soybean	17.6	61.5	9.5	58.3	26.5	60.6
Wh-Sunflower	17.8	61.2	10.0	59.7	26.1	59.9
Avg	16.8	60.2	10.0	59.1	24.3	60.2

LSD (0.05):
Comparing previous crop (corn, grain sorghum, soybean) means for same or different fertilizer N rate = 2.0 bu/a
Comparison of previous double-cropping systems (main plot) = NS

Fertilizer N (28% UAN) applied at a depth of 4 to 6 in. with a coulter-knife applicator.
NS = not significant at the 5% level of probability.

EFFECTS OF CROP ROTATION AND CULTIVAR MATURITY ON FULL-SEASON SOYBEAN YIELD IN THE PRESENCE OF SOYBEAN CYST NEMATODE

Kenneth W. Kelley and James H. Long

Summary

From 1993 through 1998, soybean yields averaged 38.6 bu/a following wheat - fallow, 36.2 bu/a following grain sorghum, 35.2 bu/a following wheat - double-crop soybean, and 30.5 bu/a following full-season soybean. Effect of soybean cultivar maturity on grain yield varied with year, depending upon time of rainfall during the critical reproductive period; however, on average, yields were highest for MG III and early MG V cultivars. Even though soybean cyst nematode (SCN) has been detected in all crop rotations, yield differences between SCN- resistant and -susceptible cultivars have been small in this study. Yield losses associated with SCN infection were highest during the initial stages of infection (1989).

Introduction

Soybean is a major crop for producers in southeastern Kansas. Typically, soybean is grown in several cropping sequences with wheat, grain sorghum, and corn or in a double-cropping rotation with wheat. In the late 1980's, the soybean cyst nematode (SCN) was detected in SE Kansas. Since then, crop rotation and resistant cultivars have been used to reduce losses associated with SCN infection. This research study seeks to determine how crop rotations and cultivars of different maturity with varying resistance to SCN affect soybean yields in the presence of SCN.

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 was 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 soybean also could be compared in odd-numbered years. In 1989, SCN was detected in the continuous soybean plots, and since then, has spread into all crop rotation treatments. Beginning in 1993, cultivars with different maturity and SCN resistance have been 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 preceding full-season soybean.

Results and Discussion

Soybean yield responses to crop rotation and soybean cultivar over a 6-year period (1993-1998) are shown in Table 1. Soybean yields averaged 38.6 bu/a following wheat - fallow, 36.2 bu/a following grain sorghum, 35.2 bu/a following wheat - double-crop soybean, and 30.5 bu/a following full-season soybean. The effect of cultivar maturity on soybean yield varied with year, depending upon time of rainfall during the critical reproductive period; however, on average, yields were highest for MG III and early MG V cultivars. Even though SCN has been detected in all crop rotations, yield differences between SCN-resistant and -susceptible cultivars have been small in this study. It is unclear why the yield losses to SCN have been smaller in this study compared to other SCN research sites in Cherokee

County. Yield losses associated with SCN infection were highest during the initial stages of infection (1989).

This 20-year crop rotation study was completed in the fall of 1998 . Final soil test data and SCN population levels will be summarized in the near future.

Table 1. Comparison of Soybean Cultivars with Different Maturity and SCN Resistance in Four Crop Rotations, 1993-1998, Columbus Unit, Southeast Ag Research Center.

			Full-Season Soybean Yield Following				
Cultivar	MG	SCN	Wheat - DC Soy	Grain Sorghum	Wheat - Fallow	Soybean	Avg*.
			bu/a	bu/a	bu/a	bu/a	bu/a
Jack	II	R	32.1	31.8	34.0	28.7	31.6[c]
Sherman	III	S	35.3	36.8	39.7	31.6	35.8[a]
Flyer	III	S	37.2	38.5	41.3	30.2	36.8[a]
DelSoy 4210	IV	R	36.8	36.5	38.2	31.9	35.8[a]
Stafford	IV	S	33.5	35.3	37.2	27.4	33.4[b]
Manokin	V	R	37.0	37.2	40.1	32.0	36.6[a]
Hutcheson	V	S	36.1	38.2	40.5	32.2	36.8[a]
Forrest	V	R	33.6	35.5	37.7	29.9	34.2[b]
Avg*.			35.2[b]	36.2[b]	38.6[a]	30.5[c]	

Crop rotation x variety interactions = NS

MG = maturity group.
SCN (soybean cyst nematode): R = resistant; S = susceptible.
*Means of crop rotation and varieties followed by a different letter are significant at the 5% level of probability.
NS = not significant at the 5% level of probability.

EFFECTS OF MATURITY ON SOYBEAN YIELD IN WHEAT AND SOYBEAN CROPPING SYSTEMS

Kenneth W. Kelley and James H. Long

Summary

Effects of cultivar maturity on soybean yield varied with year, depending on time of rainfall during the critical reproductive stage of growth. On average, full-season yields were highest for MG III and early MG V cultivars. Yield differences between soybean cyst nematode (SCN)-resistant and -susceptible cultivars were small at this site where no SCN infection has been observed. Full-season cultivars (MG V) yielded 20% higher following the wheat - fallow rotation than following a wheat - double-crop soybean system. 'Manokin' (MG V) generally gave the highest double-crop soybean yield. Double-crop soybean yields were similar for the continuous double-crop and for the 2-yr double-cropping system.

Introduction

In extreme southeastern Kansas, producers often plant double-crop soybeans following wheat harvest, or some may fallow the land after wheat harvest until the following spring crop. Full-season soybeans also may follow [wheat - double-crop soybean] in the cropping rotation. This research seeks to evaluate effects of cultivar maturity on full-season and double-crop soybean yields in 1-, 2-, and 3-yr wheat and soybean cropping systems.

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 soybean. Since 1994, cultivars with varying maturity (MG I to MG V) and resistance to soybean cyst nematode (SCN) have been planted within the three cropping systems; however, all cultivars were not included in each cropping system. Full-season soybeans were planted in late May or early to mid-June, and double-cropped soybeans were planted in late June or early July after wheat. Fertilizer (phosphorus 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 full-season and double-crop soybean yields for the different cultivars within the three wheat and soybean cropping systems for the past 5 years. Effects of cultivar maturity on soybean yield varied with year, depending on time of rainfall during the critical reproductive stage of growth. On average, full-season yields were highest for MG III and early MG V cultivars. Yield differences between SCN-resistant and -susceptible cultivars were small at this site, where no SCN infection has been observed. 'Manokin' (MG V) generally gave the highest double-crop soybean yield. 'Hutcheson' and 5292, planted full-season, yielded 20% higher following the wheat - fallow rotation than following a wheat - double-crop soybean system, although previous economic analyses typically have shown that double-cropping soybean after wheat results in more net profit than fallowing the land after wheat until the next spring crop. However, growing double-crop soybean in the rotation also increases the risk of SCN infection. 'Stafford' (SCN-susceptible) and Manokin (SCN-resistant) yielded nearly the same in the continuous double-cropping and in the 2-yr double-cropping system.

This long-term wheat and soybean cropping systems study was completed in the fall of 1998. Soil samples have been taken to determine effects of the various double-cropping systems on soil properties and to determine the presence of SCN. After soil data have been compiled, results will be summarized.

Table 1. Effects of Wheat and Soybean Cropping Systems on Full-Season and Double-Crop Soybean Yields, 1994-1998, Parsons Unit, Southeast Agricultural Research Center.

Cultivar	MG	Cropping System	Soybean Yield 1994	1995	1996	1997	1998	Avg.
			bu/a	bu/a	bu/a	bu/a	bu/a	bu/a
(Full-season soybean following wheat - double-crop soybean)								
Weber 84	I	FS - 2 yr	27.2	18.3	19.0	28.2	36.1	25.8
Jack	II	FS - 2 yr	29.6	21.9	28.2	43.9	40.0	32.7
Flyer	III	FS - 2 yr	38.1	26.5	41.1	42.7	34.5	36.6
DelSoy 4210	IV	FS - 2 yr	37.7	25.0	38.2	39.6	28.9	33.9
Stafford	IV	FS - 2 yr	45.7	26.8	37.6	42.9	24.2	35.4
Manokin	V	FS - 2 yr	46.9	29.5	35.1	40.4	24.8	35.3
Hutcheson	V	FS - 2 yr	39.6	25.4	29.3	41.8	22.9	31.8
5292	V	FS - 2 yr	43.0	23.8	30.7	41.4	23.2	32.4
(Full-season soybean following wheat - fallow)								
Hutcheson	V	FS - 3 yr	45.9	30.9	43.4	47.6	27.6	39.1
5292	V	FS - 3 yr	47.1	28.2	43.7	46.5	27.7	38.6
(Double-crop soybean ever other year)								
Weber 84	I	DC - 2 yr	19.9	14.8	7.9	10.6	14.8	13.6
Jack	II	DC - 2 yr	31.6	17.5	9.8	15.8	19.7	18.9
Flyer	III	DC - 2 yr	35.1	20.9	15.3	25.6	24.8	24.3
DelSoy 4210	IV	DC - 2 yr	33.1	20.1	18.1	24.7	21.4	23.5
Stafford	IV	DC - 2 yr	29.1	26.4	20.8	29.0	19.5	25.0
Manokin	V	DC - 2 yr	30.2	29.1	21.0	32.3	21.6	26.8
Essex	V	DC - 2 yr	28.1	24.9	21.5	29.7	20.3	24.9
5292	V	DC - 2 yr	26.6	24.4	21.5	30.4	20.2	24.6
(Continuous double-crop soybean)								
Stafford	IV	DC - 1 yr	30.9	27.9	22.4	31.2	21.9	26.9
Manokin	V	DC - 1 yr	32.4	29.5	25.9	33.8	24.6	29.2
LSD (0.05):			3.8	2.7	2.9	2.8	2.3	

FS = full-season; DC = double-crop.

COMPARISON OF SOYBEAN AND GRAIN SORGHUM CROPPING SEQUENCES

Kenneth W. Kelley

Summary

Cropping sequence had a significant effect on soybean and grain sorghum yields. In 1998, grain yields were significantly higher for first-year soybean following 5 years of grain sorghum and for soybean following grain sorghum in a 2-year rotation. Grain sorghum yield response to cropping sequence was similar to that of soybeans. Soybean and grain sorghum yields declined significantly when the same crop was grown for 3 or more consecutive years. Grain sorghum yields increased with increasing fertilizer N. However, the response to fertilizer N was small for first-year grain sorghum and for grain sorghum following soybean in the 2-year rotation, indicating significant levels of residual soil-N.

Introduction

Crop rotation is an important management tool. Research has shown that crops grown in rotation often yield 10 to 15% higher than continuous cropping systems (monoculture). However, this "rotation effect" can be affected by environmental growing conditions. This research seeks to determine how soybean and grain sorghum yields are affected by various cropping sequences and yearly climatic conditions.

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-year rotation of grain sorghum and soybean; and 3) 1, 2, 3, 4, and 5 years of one crop following 5 years of the other. Grain sorghum plots also are split to include two fertilizer nitrogen variables (60 and 120 lb N/a). Phosphorus and potassium fertilizers have been applied yearly to both crops. The site had been in native grass prior to establishing the various cropping sequences. Data from the initial 5-year period, when the rotation sequences were being established, are not shown.

Results and Discussion

Soybean yield responses for the various soybean and grain sorghum cropping sequences are shown in Table 1. In 1998, yields were similar for first-year soybean following 5 years of grain sorghum and for soybean following grain sorghum in the 2-year rotation. Second-year soybean yield was not significantly different than that of first-year soybean; however, yield declined for third- and fourth-year soybean crops. Yields were similar for fourth-, fifth-, and seventh-year (continuous) soybean crops, suggesting that the yield decline associated with the monoculture cropping system stabilizes after the third-year of continuous soybeans. In 1997, when rain distribution was ideal for grain production, soybean yields were not affected significantly by cropping sequence, suggesting that environmental growing conditions influence the rotation effect. However, more data are needed over varying climatic conditions before definite conclusions can be made concerning the "rotation effect".

Grain sorghum yield responses to cropping sequence are shown in Table 2. In 1997 and 1998, grain yields were significantly higher for first-year grain sorghum following 5 years of soybeans and for grain sorghum following soybean in the 2-year rotation. Second-yeargrain sorghum showed the typical 10 to 15% yield decline associated with monoculture. Grain sorghum yields were similar for third-, fourth-, and fifth-year crops. Grain yields increased with increasing fertilizer N. However, the response was small for first-year grain sorghum and for grain sorghum following soybean in the 2-year rotation, indicating significant levels of residual soil-N.

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

	Soybean Yield	
Soybean Sequence	1997	1998
	bu/a	bu/a
Continuous soybean	39.5	24.3
Fifth-year soybean	42.3	25.3
Fourth-year soybean	40.1	25.7
Third-year soybean	43.6	27.1
Second-year soybean	42.8	29.3
First-year soybean	40.9	30.4
Soybean - grain sorghum (2-yr rotation)	42.5	30.0
LSD (0.05):	NS	1.3

NS = not significant at the 5% level of probability.

Table 2. Comparison of Grain Sorghum Yields in Various Cropping Sequences, Parsons Unit, Southeast Agricultural Research Center.

	Grain Sorghum Yield			
	1997		1998	
Grain Sorghum Sequence	60 N	120 N	60 N	120 N
	bu/a		bu/a	
Continuous grain sorghum	115.7	133.3	74.1	82.2
Fifth-year grain sorghum	112.5	133.2	75.5	85.8
Fourth-year grain sorghum	109.4	130.1	76.9	86.5
Third-year grain sorghum	125.4	139.7	76.2	87.3
Second-year grain sorghum	119.6	132.2	79.7	91.8
First-year grain sorghum	142.5	147.9	95.0	102.5
Grain sorghum - soybean (2-yr rotation)	144.3	148.3	98.1	103.8
Avg.	124.2	137.8	82.2	91.4
LSD (0.05): N rate within same crop seq.	5.0	5.0	4.6	4.6
LSD (0.05): N rate for different crop seq.	8.9	8.9	5.1	5.1

EFFECTS OF PREVIOUS CROP AND TILLAGE ON DOUBLE-CROP SOYBEAN YIELD

Kenneth W. Kelley and Daniel W. Sweeney

Summary

Double-crop soybean yields were influenced significantly by the crop preceding wheat in the rotation. When corn or grain sorghum preceded wheat, double-crop soybean yields were 15% higher than when full-season soybean preceded wheat. Double-crop soybean yield was not affected by tillage method (no-till versus disking).

Introduction

In extreme southeastern Kansas, double-crop soybeans typically are planted after wheat. Wheat straw traditionally has been burned to facilitate seedbed preparation. However, improved equipment and herbicide technology has made no-till planting of double-crop soybean more feasible in high-residue conditions. This research seeks to determine the effects of previous crop and tillage on double-crop soybean yield.

Experimental Procedure

Beginning in 1996, a 2-yr crop rotation study was started at the Columbus Unit. Corn, grain sorghum, and full-season soybeans are planted in the first year of the rotation. In the fall, wheat is planted on all plots, then double-crop soybeans are planted in the second year following wheat harvest. Tillage methods include either disking the residue (without burning) or planting no-till. Roundup Ready soybeans (MG IV) are planted at 30-inch row spacing.

Results and Discussion

In 1997 and 1998, double-crop soybean yields were influenced significantly by the crop preceding wheat in the rotation (Table 1). When corn or grain sorghum preceded wheat, double-crop soyean yields were 15% higher than when full-season soybean preceded wheat. It is unclear why this yield benefit occurred. Having both full-season and double-crop soybean in the rotation, even though wheat was grown between the two soybean crops, may have contributed to the yield decline. Further plant and soil samplings are planned to determine why this yield response occurred.

Double-crop soybean yield was not affected by tillage method (no-till versus disking) in either 1997 or 1998. Seed emergence was good with both tillage systems. This research was supported by Kansas Soybean Check-Off funding.

Table 1. Effects of Previous Crop and Tillage Method on Double-Crop Soybean Yield, Columbus Unit, Southeast Agricultural Research Center.

Previous Crop (before wheat)	Tillage* Method	Double-Crop Soybean Yield 1997	1998
		bu/a	bu/a
Corn	No-Till	38.5	31.8
Corn	Disk	39.3	31.2
Grain Sorghum	No-Till	39.4	30.9
Grain Sorghum	Disk	40.3	32.2
Soybean	No-Till	33.2	26.2
Soybean	Disk	32.8	26.3
Means:			
Corn		38.9	31.5
Grain Sorghum		39.9	31.6
Soybean		33.0	26.3
LSD (0.05):		2.3	2.9
No-Till		37.0	29.6
Disk		37.5	29.9
LSD (0.05):		NS	NS

NS = not significant at the 5% level of probability.

* Tillage method of previous crops and double-crop soybean.

EFFECT OF SOIL pH ON CROP YIELD

Kenneth W. Kelley

Summary

Grain yields of wheat, soybean, and grain sorghum have increased as soil acidity decreased, except for a slight yield reduction in some years at the highest pH range. Results confirm the importance of maintaining soil pH near the neutral level (7.0) for highest grain yields and nutrient uptake.

Introduction

In southeast Kansas, nearly all topsoils are naturally acidic (pH less than 7.0). 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.

Experimental Procedures

Beginning in 1989, five soil pH levels ranging from 5.5 to 7.5 were established on a native grass site at the Parsons Unit. The crop rotation consists of wheat - double-cropped soybean, grain sorghum, and soybeans and uses conventional tillage practices. In 1998, plant and grain samples also were taken to determine pH effects on nutrient concentrations of plant and grain samples.

Results and Discussion

In 1998, soybean yield and whole-plant nutrient concentration were influenced significantly by soil pH (Table 1). The highest grain yield occurred at pH levels slightly above 7.0. Whole-plant nutrient concentrations of nitrogen (N), phosphorus (P), and potassium (K) also incresed as soil acidity decreased; however, P uptake was affected to a greater degree followed by N and K. Nutrient concentrations of N, P, and K in the grain also were influenced by pH.

Grain yield responses for the various soil pH treatments over several years are shown in Table 2. Yield responses of wheat and grain sorghum to lime applications have been similar to that of soybeans in this study. Results confirm the importance of maintaining soil pH near the neutral range (7.0), regardless of the crop being grown.

Table 1. Effects of Soil pH on Soybean Yield and Whole-Plant Nutrient Concentration, Parsons Unit, Southeast Agricultural Research Center.

	Soybean	Whole-Plant Concentration			Grain Concentration		
Soil pH	Yield	N	P	K	N	P	K
	bu/a	%	%	%	%	%	%
5.5	25.4	2.57	0.215	1.23	5.74	0.440	1.57
6.4	26.4	2.74	0.242	1.07	5.98	0.498	1.56
6.8	27.5	2.77	0.250	1.06	6.07	0.511	1.56
7.2	28.9	2.69	0.261	1.04	6.05	0.516	1.54
7.6	30.0	2.91	0.280	1.07	6.11	0.529	1.55
LSD (0.05):	1.1	0.19	0.010	0.10	0.14	0.014	NS

Soil pH (0-6 in. depth) after 1997 fall harvest.

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

	1994	1996	1996	1993	1997
Soil pH	Soybean	Wheat	DC Soybean	Gr Sorghum	Gr Sorghum
	bu/a	bu/a	bu/a	bu/a	bu/a
5.5	25.0	27.4	19.0	59.4	112.4
6.4	25.9	32.5	21.5	65.6	123.8
6.8	35.6	33.5	22.5	70.3	134.8
7.2	36.2	37.2	24.2	82.6	134.1
7.6	38.3	38.7	22.6	84.2	129.7
LSD (0.05):	3.7	3.3	1.2	4.5	3.7

Soil pH (0-6 in. depth) after 1997 fall harvest.

SOYBEAN HERBICIDE RESEARCH

Kenneth W. Kelley

Summary

In 1998, soybean yield responses to herbicides varied, depending upon the degree and duration of weed control. In the Roundup Ready system, soybean yields were reduced from early weed competition, even though all weeds were controlled 1 month after planting. When weed pressure was heavy, late-emerging weeds also reduced yields both in the Roundup Ready and STS systems.

Experimental Procedures

In 1998, various herbicides were evaluated using conventinal, Roundup Ready, and sulfonylurea-tolerant (STS) seed and herbicide systems using conventional tillage methods. 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 to four times. The center two rows of each plot were harvested for yield. Weed ratings were visual estimates of percent weed control for a naturally occurring weed population.

Results and Discussion

Soybean weed control and yield results comparing conventional herbicide treatments with Roundup Ready and STS systems are shown in Tables 1, 2, 3, and 4. General comments concerning herbicide performance are given at the conclusion of respective tables.

Table 1. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Parsons Unit, Southeast Agricultural Research Center, 1998.

				Weed Control			
Trt	Herbicide	Time	Rate	Lacg	Cowh	Cawe	Yield
			product/a	%	%	%	bu/a
1	Dual II Magnum	PRE	1.3 pt	96	100	100	34.1
	Synchrony STS	PO	0.5 oz				
	Crop oil	PO	1 %				
	28 % N	PO	1 qt				
2	Axiom	PRE	13 oz	90	100	100	32.3
	Synchrony STS	PO	0.5 oz				
	Crop oil	PO	1 %				
	28 % N	PO	1 qt				
3	Canopy XL	PRE	4.6 oz	90	100	100	29.5
	Synchrony STS	PO	0.5 oz				
	Crop oil	PO	1 %				
	28 % N	PO	1 qt				
	Assure II	L-PO	8 oz				
	Crop oil	L-PO	1 qt				
4	Synchrony STS	PO	0.5 oz	86	94	80	31.8
	Crop oil	PO	1 %				
	28 % N	PO	1 qt				
	Assure II	PO-seq	8 oz				
	Crop oil	PO-seq	1 qt				
5	Synchrony STS	PO	0.5 oz	82	90	75	30.7
	Assure II	PO	8 oz				
	Crop oil	PO	1 qt				
	28 % N	PO	1 qt				

(continued)

Table 1. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Parsons Unit, Southeast Agricultural Research Center, 1998 (continued).

				Weed Control			
Trt	Herbicide	Time	Rate	Lacg	Cowh	Cawe	Yield
			product/a	%	%	%	bu/a
6	Synchrony STS	PO	0.5 oz	96	100	98	32.0
	Cobra	PO	6 oz				
	Crop oil	PO	0.5 %				
	28 % N	PO	1 qt				
	Assure II	PO-seq	8 oz				
	Crop oil	PO-seq	1 qt				
7	Squadron	PPI	3 pt	89	100	100	29.6
8	Steel	PPI	3 pt	97	100	100	32.4
9	Prowl	PPI	2.4 pt	94	100	100	32.7
	Raptor	PO	4 oz				
	Status	PO	10 oz				
	Crop oil	PO	1 qt				
	28 % N	PO	1 qt				
10	Treflan + Broadstrike	PPI	1 qt	90	100	100	32.6
	First Rate	PO	0.3 oz				
	NIS	PO	0.125 %				
	28 % N	PO	2.5 %				
11	Frontier 6EC	PRE	22 oz	94	100	100	29.9
	Storm	PO	1.5 pt				
	Crop oil	PO	1 %				
	28 % N	PO	1 qt				

(continued)

Table 1. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Parsons Unit, Southeast Agricultural Research Center, 1998 (continued).

				Weed Control			
Trt	Herbicide	Time	Rate	Lacg	Cowh	Cawe	Yield
			product/a	%	%	%	bu/a
12	Dual II Magnum	PRE	1.3 pt	97	100	100	32.1
	Expert	PO	1.25 oz				
	Cobra	PO	6 oz				
	Crop oil	PO	1 %				
	28 % N	PO	1 qt				
13	Canopy XL	PRE	4.6 oz	100	100	100	32.9
	Roundup Ultra	MPO	1 qt				
14	Axiom	PRE	13 oz	100	100	100	32.7
	Roundup Ultra	MPO	1 qt				
15	Squadron	PPI	3 pt	100	100	100	31.0
	Roundup Ultra	MPO	1 pt				
16	Roundup Ultra	MPO	1 qt	100	92	100	32.4
	Cultivation						
17	Roundup Ultra	MPO	1 qt	100	90	100	32.1
	Roundup Ultra	L-PO	1.5 pt				
18	Raptor	PO	5 oz	93	97	100	31.6
	Roundup Ultra	PO	1 pt				
19	Dual II Magnum	PRE	1.3 pt	96	100	100	31.1
	First Rate	PO	0.3 oz				
	Flexstar	PO	1 pt				
	NIS	PO	0.125 %				
	28 % N	PO	2.5 %				

(continued)

Table 1. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Parsons Unit, Southeast Agricultural Research Center, 1998 (continued).

				Weed Control			
Trt	Herbicide	Time	Rate	Lacg	Cowh	Cawe	Yield
			product/a	%	%	%	bu/a
20	Roundup Ultra	MPO	1 qt	100	100	100	31.8
	Classic	MPO	0.33 oz				
	Crop oil	MPO	1 %				
	28 % N	MPO	1 qt				
21	No herbicide	---	---	0	0	0	18.7
	LSD (0.05):			5	6	5	2.6

Weed rating: July 14 and July 28.
Planted: June 3, 1998.
Variety: Asgrow 4501 (STS & RR).
Lacg = large crabgrass; cowh = common waterhemp; cawe = carpet weed.
PPI = preplant incorporated (6/1); PRE = preemergent (6/3); PO = postemergent (6/25);
MPO = medium postemergent (7/2); L-PO = late postemergent (7/14).

General comments:
Early weed pressure was moderate from large crabgrass and common waterhemp; however, a dense soybean canopy reduced late-season weed competition. All herbicide treatments gave good to excellent weed control; however, large-seeded broadleaf weeds were not present in this study. Large crabgrass control was reduced somewhat when Synchrony was tankmixed with Assure II at the rates used in this study. Because of the tall soybean height and lack of late-season weed competition, no difference in weed control or grain yield occurred between one or two postemergent applications of Roundup.

Table 2. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998.

				Weed Control				
				Cocb		Vele	Lacg	
Trt	Herbicide	Time	Rate	7-16	9-15	9-15	7-24	Yield
			product/a	%	%	%	%	bu/a
1	Dual II Magnum	PRE	1.3 pt	97	74	70	98	16.5
	Synchrony STS	PO	0.5 oz					
	Crop oil	PO	1 %					
	28 % N	PO	1 qt					
2	Axiom	PRE	13 oz	97	69	74	98	16.0
	Synchrony STS	PO	0.5 oz					
	Crop oil	PO	1 %					
	28 % N	PO	1 qt					
3	Canopy XL	PRE	4.6 oz	98	88	90	92	21.8
	Synchrony STS	PO	0.5 oz					
	Crop oil	PO	1 %					
	28 % N	PO	1 qt					
4	Synchrony STS	PO	0.5 oz	97	73	72	98	16.0
	Assure II	PO	8 oz					
	Crop oil	PO	1 qt					
	28 % N	PO	1 qt					
5	Synchrony STS	PO	0.5 oz	98	70	65	98	15.6
	Crop oil	PO	1 %					
	28 % N	PO	1 qt					
	Assure II	PO-seq	8 oz					
	Crop oil	PO-seq	1 qt					

(continued)

Table 2. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998 (cont'd).

				Weed Control				
				Cocb		Vele	Lacg	
Trt	Herbicide	Time	Rate	7-16	9-15	9-15	7-24	Yield
			product/a	%	%	%	%	bu/a
6	Synchrony STS	PO	0.5 oz	94	67	98	98	15.1
	Cobra	PO	4 oz					
	Crop oil	PO	0.5 %					
	28 % N	PO	1 qt					
	Assure II	PO-seq	8 oz					
	Crop oil	PO-seq	1 qt					
7	Roundup Ultra	MPO	1 qt	98	72	75	98	16.7
8	Roundup Ultra	MPO	1 qt	98	95	90	98	20.9
	Roundup Ultra	LPO	1.5 pt					
9	No herbicide	---	---	0	0	0	0	4.4
	LSD (0.05):			5	7	8	4	3.8

Cocb = common cocklebur; vele = velvetleaf; lacg = large crabgrass.
Planting date: June 4, 1998; Variety (Asgrow 4501 RR & STS).
Herbicide applications: preemergent (PRE) = June 4; postemergent (PO) = June 24; medium postemergent (MPO) = July 6; late postemergent (LPO) = July 13.

General comments:
Early weed competition was high from cocklebur, moderate from velvetleaf, and light from large crabgrass. All postemergent herbicide treatments gave good to excellent early-season broadleaf weed control. However, abundant rainfall in July promoted an additional flush of cocklebur and velvetleaf. Because plots were not cultivated, final yields likely were reduced because of the late-emerging weeds. In addition, high temperatures during late August and early September reduced soybean yield significantly and probably masked some of the herbicide treatment effects. Grain yield and weed control were significantly better with two Roundup applications compared to a single application 1 month after planting; however, where early-season weed competition is heavy, results suggest that Roundup should be applied earlier than 1 month after planting. With the STS soybean program, results also indicate that where heavy cocklebur weed competition is expected, a soil application of Canopy XL followed by Synchrony STS gave better weed control than a single postemergent application of Synchrony.

Table 3. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998.

				Weed Control				
				Cocb		Vele	Lacg	
Trt	Herbicide	Time	Rate	7-16	9-15	7-16	7-24	Yield
			prod./a	%	%	%	%	bu/a
1	Treflan	PPI	1 qt	93	58	87	98	10.6
	Roundup Ultra	MPO	1 pt					
2	Treflan + Broadstrike	PPI	1 qt	98	75	97	98	14.0
	Roundup Ultra	MPO	1 pt					
3	Treflan	PPI	1 qt	98	78	98	98	12.1
	First Rate	PPI	0.6 oz					
	Roundup Ultra	MPO	1 pt					
4	First Rate	PRE	0.6 oz	98	79	98	98	15.0
	Prowl	PRE	3 pt					
	Roundup Ultra	MPO	1 pt					
5	Python	PRE	1 oz	98	86	98	98	12.5
	Prowl	PRE	3 pt					
	Roundup Ultra	MPO	1 pt					
6	Python	PRE	0.6 oz	96	87	98	98	13.4
	Roundup Ultra	MPO	1 pt					
7	First Rate	PRE	0.6 oz	98	92	98	98	13.6
	Roundup Ultra	MPO	1 pt					
8	First Rate	PO	0.3 oz	98	87	84	98	11.3
	Roundup Ultra	MPO	1 pt					
9	Roundup Ultra	MPO	1 qt	98	70	82	98	11.6

(continued)

Table 3. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998 (cont'd).

				Weed Control				
				Cocb		Vele	Lacg	
Trt	Herbicide	Time	Rate	7-16	9-15	7-16	7-24	Yield
			prod./a	%	%	%	%	bu/a
10	Roundup Ultra	MPO	1 qt	98	92	84	98	14.8
	Roundup Ultra	LPO	1.5 pt					
11	No herbicide	PO		0	0	0	0	3.4
	LSD (0.05)			4	6	5	4	3.0

Cocb = common cocklebur; vele = velvetleaf; lacg = large crabgrass.
Planted: June 4, 1998.
Variety: Asgrow 4501 (RR & STS).
Herbicide applications: preplant incorporated (PPI) = June 4; preemergent (PRE) = June 4; medium postemergent (MPO) = July 6; late postemergent (LPO) = July 13.

General comments: Early weed competition was high from cocklebur, moderate from velvetleaf, and light from large crabgrass. Preplant incorporated and preemergent herbicide treatments of Python or Broadstrike and First Rate gave excellent control of velvetleaf. A follow-up postemergent application of Roundup (1 pt/a) gave good control of cocklebur, although abundant rainfall in July resulted in a second flush of cocklebur, which likely reduced final yields. Early cocklebur competition also likely reduced yields where no soil application of herbicide was made. High temperatures in late August and early September resulted in severe drought stress and reduced yields significantly. If dense early weed competition is expected, results indicate that Roundup should be applied earlier than 4 weeks after planting, especially if a preplant or preemergent herbicide was not applied.

Table 4. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998.

				Weed Control				
				Cocb		Vele	Lacg	
Trt	Herbicide	Time	Rate	7-16	9-15	7-16	7-24	Yield
			product/a	%	%	%	%	bu/a
1	Squadron	PPI	3 pt	93	77	84	91	18.4
2	Tri-Scept	PPI	2.33 pt	96	84	80	88	17.4
3	Steel	PPI	3 pt	97	78	98	98	17.9
4	Prowl	PPI	2.4 pt	95	67	97	98	17.2
	Pursuit	PO	1.44 oz					
	Status	PO	10 oz					
	Crop oil	PO	1 qt					
	28 % N	PO	1 qt					
5	Prowl	PPI	2.4 pt	96	81	98	98	17.0
	Raptor	PO	4 oz					
	Status	PO	10 oz					
	Crop oil	PO	1 qt					
	28 % N	PO	1 qt					
6	Squadron	PPI	3 pt	96	82	96	98	17.9
	Roundup Ultra	PO	1 pt					
7	Steel	PPI	3 pt	98	83	98	98	18.1
	Roundup Ultra	PO	1 pt					
8	Prowl	PPI	2.4 pt	97	87	96	98	18.9
	Pursuit	PO	1.44 oz					
	Crop oil	PO	1.5 pt					
	28 % N	PO	1 qt					

(continued)

Table 4. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998 (cont'd).

				Weed Control				
				Cocb		Vele	Lacg	
Trt	Herbicide	Time	Rate	7-16	9-15	7-16	7-24	Yield
			product/a	%	%	%	%	bu/a
9	Pursuit	PO	1.44 oz	98	83	98	97	18.4
	Crop oil	PO	1.5 pt					
	28 % N	PO	1 qt					
	Roundup Ultra	PO	1 pt					
10	Prowl	PPI	2.4 pt	94	70	98	98	17.5
	Raptor	PO	4 oz					
	Crop oil	PO	1.5 pt					
	28 % N	PO	1 qt					
	Roundup Ultra	PO	1 pt					
11	Raptor	PO	5 oz	95	67	98	96	18.2
	Crop oil	PO	1.5 pt					
	28 % N	PO	1 qt					
	Roundup Ultra	PO	1 pt					
12	Roundup Ultra	PO	1 qt	98	77	88	98	17.9
13	Roundup Ultra	PO	1 qt	98	90	98	98	19.2
	Roundup Ultra	L-PO	1.5 pt					
14	Axiom	PRE	13 oz	98	78	96	98	18.1
	Roundup Ultra	PO	1 qt					
15	No herbicide	---	---	0	0	0	0	8.7
	LSD (0.05):			5	7	6	5	3.3

Planted June 4, 1998 (Asgrow 4501 RR & STS).

Herbicide applications: preplant incorporated (PPI) and preemergent (PRE) = June 4; postemergent (PO) = July 6; late postemergent (LPO) = July 13.

Table 4. Effects of Herbicides and Time of Application on Weed Control and Yield for Soybeans, Columbus Unit, Southeast Agricultural Research Center, 1998 (cont'd).

General comments:
Weed competition was heavy from cocklebur, moderate from velvetleaf, and light from large crabgrass. Both soil-applied and postemergent herbicide treatments gave good early-season weed control; however, abundant rainfall in July resulted in a second flush of cocklebur and velvetleaf. Although broadleaf weeds were controlled effectively with two postemergent applications of Roundup, grain yields likely were reduced from early cocklebur competition during the first month after planting. High temperatures in late August and early September resulted in severe drought stress and likely masked some of the herbicide treatment effects on yield.

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 soybean cyst nematode (SCN) have prevented as much as 50 % of the grain yield loss seen for varieties without such resistance in Cherokee County, Kansas since 1991. During this 5-year study, drought occurred in 1995 and 1998, whereas 1994, 1996, and 1997 were normal to wet years. Several varieties in both Maturity Groups IV and V had very good yield potential and adequate SCN resistance. These could be used in suitable rotations to combat the pest.

Introduction

The appearance of SCN 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 resistant varieties. 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

Fifty four varieties of soybeans, some rated as resistant to SCN, were planted on June 2, 1998, in cooperation with Neil and Gary Martin, who farm near 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 SCN prevented yield losses of 30 % to 40% during the years 1994 - 1997 and 10% to 20% in 1998 (Table 1). Resistant Maturity Group (MG) V varieties such as 'Manokin' averaged yields of nearly 36 bu/a for the 5-year period. Susceptible varieties of similar maturity, such as 'Hutcheson', had average yields of only 27 bu/a during the same period. Several new resistant MG IV varieties yielded 30-32 bu/a during 1998 and were superior to ‘Flyer’, a susceptible early MG IV variety that yielded approximately 25 bu/a. These varieties are ones to watch in the future and include Midland 8421N and X450NSTS, DynaGro DG-3411NSTS and DG-3438N, and Terra E438. Several older MG IV and MG V varieties have good 2- and 3-year yields of more than 33 bu/a. More variety test information can be found in Rep. of Progress 825, 1998 Kansas Performance Tests with Soybean Varieties.

[1]Department of Agronomy, KSU.

[2]Former Cherokee County Extension agent.

[3]Department of Plant Pathology, KSU.

Table 1. Grain Yield of SCN Soybean Variety Trial in Southeastern Kansas, 1994 - 1998 and Summaries.

Brand	Variety	MG	1994	1995	1996	1997	1998	2-yr	3-yr	4-yr	5-yr
			bu/a								
Agripro	AP4540SCN	IV	--	--	--	--	30.0	--	--	--	--
Agripro	AP543RR	V	--	--	--	--	33.6	--	--	--	--
Deltapine	DPS8S49(EXP)	IV	--	--	--	--	28.9	--	--	--	--
Dekalb	CX496C	IV	--	--	--	--	29.0	--	--	--	--
Dekalb	CX510C	V	--	--	32.0	41.7	30.4	36.0	34.7	--	--
Delange	DS466	IV	--	--	38.0	31.2	30.2	30.7	33.1	--	--
Dynagro	DG3411NSTS	IV	--	--	--	--	31.4	--	--	--	--
Dynagro	DG3438N	IV	--	--	--	--	32.0	--	--	--	--
Hoegemeyer	471 SCN	IV	--	--	--	37.5	24.6	31.0	--	--	--
Hoegemeyer	460NRR	IV	--	--	--	--	30.6	--	--	--	--
Golden Harvest	H1454	IV	--	25.6	29.9	34.8	29.4	32.1	31.4	29.9	--
Golden Harvest	H1487	V	--	--	--	--	28.4	--	--	--	--
Golden Harvest	H1500	V	--	30.4	31.3	38.6	26.1	32.4	32.0	31.6	--
Missouri Premium	Magellan	IV	--	--	--	34.4	25.3	29.8	--	--	--
Missouri Premium	Mustang	IV	--	--	--	40.3	26.3	33.3	--	--	--
Midland	8421	IV	--	--	--	--	32.9	--	--	--	--
Midland	8420STS	IV	--	--	--	--	27.6	--	--	--	--
Midland	X450NSTS	IV	--	--	--	--	31.2	--	--	--	--
Midland	8475	IV	39.3	28.4	33.9	40.1	31.0	35.5	35.0	33.3	34.5
Midland	8530	V	--	--	--	41.4	22.0	31.7	--	--	--
Mycogen	5474	IV	--	--	--	--	24.1	--	--	--	--
NC+	5A44	V	--	--	35.3	41.9	32.2	37.0	36.5	--	--
NK	S46-W8	IV	--	--	--	--	25.5	--	--	--	--
NK	3505	V	--	--	--	40.3	27.0	33.7	--	--	--
NK	S57-11	V	--	28.4	33.4	41.2	28.1	34.7	34.2	32.8	--
Pioneer	94B41	IV	--	--	--	41.7	25.0	33.3	--	--	--
Pioneer	9492	IV	--	--	--	40.7	32.0	36.3	--	--	--
Pioneer	95B33	V	--	--	--	--	29.8	--	--	--	--
Stine	4199-21	IV	--	--	--	--	28.8	--	--	--	--
Terra	E438	IV	--	--	--	--	31.8	--	--	--	--
Terra	TS4792	IV	33.8	27.5	31.5	38.9	28.8	33.9	33.1	31.7	32.1
Terra	TS5504	IV	--	--	31.0	41.3	24.9	33.1	32.4	--	--
Willcross	9449NSTS	IV	--	--	--	--	20.5	--	--	--	--
Willcross	RR2449N	IV	--	--	--	--	27.7	--	--	--	--
Willcross	RR2467N	IV	--	--	--	--	31.4	--	--	--	--
Willcross	RR2517N	V	--	--	--	--	33.8	--	--	--	--
Public	Flyer	IV	20.2	18.1	25.3	27.9	25.3	26.6	26.2	24.1	24.3
Public	Hutcheson	V	25.4	31.5	23.2	26.0	25.8	31.2	29.5	27.9	28.6
Public	Hartwig	V	36.1	30.5	28.2	38.3	28.2	33.2	31.6	31.3	32.3
Public	Manokin	V	42.2	32.3	37.4	40.7	26.7	33.7	34.9	34.3	35.9
Public	KS 5292	V	--	28.7	27.7	39.1	26.1	32.6	31.0	30.4	--
Public KSOY	Stressland	IV	--	19.3	26.7	32.9	24.3	28.6	28.0	25.8	--
Public KSOY	Delsoy5500	V	--	--	--	40.4	30.0	35.2	--	--	--
Public	Anand	V	--	--	--	--	26.1	--	--	--	--
Public	K1366	IV	--	--	--	--	24.5	--	--	--	--
Public	K1364	V	--	--	--	--	28.5	--	--	--	--
Average			35.6	26.9	30.2	37.9	28.2	--	--	--	--
LSD (.1)			3.6	2.7	3.8	4.1	4.0	--	--	--	--

PERFORMANCE TRIAL OF DOUBLE-CROPPED SOYBEAN VARIETIES

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

Summary

Forteen double-cropped soybean varieties were planted following winter wheat in Parsons, Kansas and evaluated for yield and other agronomic characteristics throughout the summer of 1998. Grain yields were very poor, reflecting a disastrous late-season drought, with hot and extended dry weather during bloom and early podding. Yield was less than 10 bu/a. Generally, varieties were more than 2.5 to 3 ft tall yet lacked developed pods. All varieties were affected by the drought. It also caused maturity problems in both the short-season Maturity Group (MG) IV varieties and long-season varieties in MG V. All varieties matured from mid to late September but had scattered green leaves until frost.

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 be harvested. They also should mature before a threat of frost.

Experimental Procedures

Soybean varieties were planted to moisture following winter wheat harvest at the Southeast Agricultural Research Center at Parsons. The soil is a Parsons silt loam. The wheat stubble was burned, then Squadron herbicide was applied before the area was field cultivated prior to planting. Soybean then was planted on June 22 1998 at 10 seed per foot of row. A shower 24 hours after planting assured a nearly perfect stand. Plants grew very well until late August, when soil moisture depletion and hot dry weather combined to have devastating effects on bloom and early pod setting. Plants had few full pods. These were harvested on October 23, 1998.

Results and Discussion

Yields ranged from 1.4 bu/a to near 8 bu/a (Table 1). The low yields affected all varieties; however, late MGV varieties outyielded the early maturity MGIV varieties. In fact, the two highest yielding varieties, 'Manokin' and 'Pioneer 95B33' were also the latest in maturity. The very low yields may also have been influenced by the tillage done after wheat harvest but before soybean planting that could have contributed to soil drying and thus reduced available soil moisture. Several no-till planted fields less than a quarter mile from this field hadmuch better grain yields, as did some July-planted fields that bloomed and podded later after rains came.

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[1]Southeast Area Extension Office.

Table 1. Yield of Double-Cropped Variety Trial for Soybeans at Columbus, Parsons, and Altamont, Kansas, 1994-1998. Grouping based on maturity.

		Yield					1998 Characteristics	
Brand	Variety	1998	1997	1996	1995	1994	Height of Plant	Mat. from Sept. 1
		----------------bu/a-----------------					-in-	
Stine	3870	3.7	--	--	--	--	30.0	18.3
Dyna-Gro	DG3398RR	3.0	--	--	--	--	32.0	19.5
Dyna-Gro	UAPX-258RR	3.3	--	--	--	--	31.5	20.5
Check Early MG IV	Flyer	2.8	40.1	10.1	14.9	17.0	32.5	18.8
Golden Harvest	H1454	3.5	--	--	--	--	31.8	20.5
Golden Harvest	H1487	3.4	--	--	--	--	34.5	25.0
Pioneer	9492	2.3	--	--	--	--	29.3	24.8
Pioneer	9521	5.2	41.9	21.9	--	--	34.5	18.8
Pioneer	95B33	6.7	--	--	--	--	36.8	34.0
Mycogen	470	2.0	40.8	--	--	--	34.0	19.8
Mycogen	5474	1.4	--	--	--	--	34.0	19.3
Check Mid MG IV	KS4694	1.8	40.2	6.5	--	--	29.0	19.0
Check Early MG V	KS5292	2.7	39.5	13.3	13.8	25.4	33.3	27.0
Public Early MG V	Manokin	7.8	43.5	17.4	19.8	26.5	33.8	29.0
LSD (0.05)		1.4	5.2	5.6	--	--	2.8	7.2
Averages		3.4	38.2	11.4	15.6	23.6	15.5	--

The 5-year average for Manokin, early MG V, is 23 bu/a whereas the early MG IV Flyer is 17 bu/a.

PERFORMANCE TRIAL OF RIVER-BOTTOM SOYBEAN VARIETIES

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

Summary

Forteen 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 1998. Grain yields were excellent, and variety differences were seen with the very productive soils. Yields ranged from 33.3 bu/a to over 46 bu/a. The shorter-season Maturity Group (MG) IV varieties yielded as well or better than 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

Forteen soybean varieties were grown following corn in 1997. The farmer/cooperator was Joe Harris. The soil is a Lanton deep silt loam that sits on the Neosho flood plain approximately 1750 ft from the river channel. The soil was disked, Squadron herbicide was applied, and the soil was field cultivated prior to planting. Soybean then was planted on June 1, 1998 at 10 seed per foot of row. Plants emerged to form an excellent stand. Basagran was applied postemergent to help control cocklebur. Warm and moist conditions persisted until late summer, and plants grew well throughout the season. The soybeans were harvested on October 16, 1998.

Results and Discussion

Yields ranged from 33.3 bu/a to 46.6 bu/a (Table 1). Several varieties yielded more than 40 bu/a for the 1998 growing season, and one of these, Pioneer ‘9412' has averaged more than 60 bu/a for the 3 years of the study. The varieties Pioneer 9412, and 9421 have the highest 2 year averages. Consideration should be given to plant height and its effect on lodging as well as plant maturity. Overall plant height ranged from 28.5 to 40.8 in. With respect to plant maturity, the indeterminate, early to mid MG IV varieties yielded as well or better than the determinate growth habit, MG V varieties in the test.

[1]Southeast Area Extension Office.

Table 1. Yield of River-Bottom Soybean Variety Trial at Erie, Kansas, 1996-1998.

Brand	Variety	Grain Yield 1998	1997	1996	2yr	3 yr Avg	1998 Characteristics Lodging[1] Avg	Height of	Mat from Plant	Sep 1
		--------bu/a--------							-in-	
Pioneer	9421	41.8	60.5	--		52.2	--	3.5	40.8	18.3
Pioneer	9412	46.6	63.5	70.8		55.1	60.3	2.8	36.5	18.5
Golden Harvest	H1454	44.8	--	--		--	--	2.3	40.0	23.3
Mycogen	5474	46.6	--	--		--	--	2.3	40.5	23.8
DynaGro	UAPX-2588RR	45.0	--	--		--	--	2.3	38.8	23.8
Garst	D454	42.0	--	--		--	--	2.0	37.8	25.3
DynaGro	D63463 NRR	33.3	--	--		--	--	2.0	39.3	26.0
Mid Check	KS4694	37.8	53.1	65.7		45.5	52.2	3.0	35.5	26.3
Garst	D478	44.9	--	--		--	--	3.5	40.3	27.3
Pioneer	9492	41.4	--	--		--	--	2.0	36.5	27.3
Stine	4790	41.0	--	--		--	--	3.0	35.5	27.5
Mycogen	58520	43.8	--	--		--	--	2.5	30.5	28.8
Golden Harvest	H1500	43.7	--	--		--	--	1.8	28.5	29.5
Late Check	KS5292	34.3	56.9	58.1		45.6	49.8	2.0	29.5	30.0
Averages		41.9	58.2	62.8		50.1	54.3	2.3	36.4	--
(L.S.D. 0.05)		5.0	5.8	6.9		--	--	0.9	4.0	1.4

[1] Lodging based on a scale of 1 to 5 with 1 standing upright and 5 flat on the ground.

PERFORMANCE TRIAL OF SUNFLOWER HYBRIDS WITH TWO PLANTING DATES

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

Summary

Five sunflower hybrids were grown on upland soils and evaluated for yield and other agronomic characteristics throughout the summer of 1998. The weather was favorable early in the season but hot and dry late in the summer. Seed yields were acceptable in some varieties, and yield differences were seen. Yields ranged from 1570 to 2036 lb/a. The second (late) planting was destroyed by animal damage to the roots that caused severe lodging.

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 also low levels of lodging, because sunflower is a tall crop.

Experimental Procedures

Five sunflower hybrids were grown in 1998 following a previous crop of corn on the Mark Piper farm in Altamont, KS. The soil is a Catoosa silt loam that typically is cropped on the upland. Treflan herbicide was applied, and the soil was prepared for planting. Ninety lb/a of N were added prior to planting. The first planting occurred on May 23, 1998, and the second planting occurred following a field cultivation on July 3, 1998. Stands were thinned back to 20,000 plants/a. The plots then were cultivated before canopy closure. Excellent growing conditions lasted until late in the summer, so good growth and early development occurred. Sunflowers for the early planting were harvested on October 16, 1998.

Results and Discussion

Yields ranged from 1570 lb/a to 2036 lb/a (Table 1) and were good for this area of the state. Average yields from the first planting date were much higher than those in 1997. The hybrids NK 231 and SF 187 were in the top-yielding group. Over the 3 years of the study, NK 231 has been in the top grouping each year. Consideration should be given to the height and lodging characteristics of each hybrid. Sunflowers can be tall, and the average height for the first planting date was over 5 ft, but lodging was not a problem.

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[1]Southeast Area Extension Office.

Table 1. Seed Yield of Sunflower Hybrids Planted Early (May 28, 1996, June 7, 1997 and May 23, 1998) in Southeastern Kansas.

Brand	Hybrid	Yield			Average Yield		Height of Plant
		1998	1997	1996	2 yr	3 yr	1998
		--------------------------lb/a			------------------------		-in-
Cargill	SF187	1920	974	1884	1447	1593	52
Cargill	SF270	1578	988	--	1283	--	52
NK	231	2036	1240	1759	1638	1678	56
Pioneer	8370	1571	--	--	--	--	60
Triumph	Calvary	1608	--	--	--	--	51
Averages		1743	934	1567	1339	1415	54
LSD (0.05 in 1996, 0.1 in 1997-98)		426	224	655	--	--	5

ANNUAL WEATHER SUMMARY FOR PARSONS — 1998

Mary Knapp[1]

1998 Data

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Avg. Max	42.2	51.3	49.6	64.8	80.5	87.2	89.8	89.3	87.4	70.0	58.9	48.0	68.3
Avg. Min	28.6	31.9	34.2	44.4	59.0	65.4	71.0	67.2	64.3	49.2	39.7	27.3	48.5
Avg. Mean	35.4	41.6	41.9	54.6	69.8	76.3	80.4	78.2	75.9	59.6	49.3	37.7	58.4
Precip	2.52	0.4	5.19	3.4	1.96	5.41	5.09	3.42	9.02	7.92	3.58	1.76	49.70
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*	917	720	730	322	47	23	0	0	1	189	472	847	4266
Cool DD*	0	0	14	10	195	361	478	410	327	21	2	0	1817
Rain Days	7	4	8	6	5	6	12	6	5	8	8	4	79
Min < 10	0	1	1	0	0	0	0	0	0	0	0	2	4
Min < 32	22	20	14	0	0	0	0	0	0	0	4	23	83
Max > 90	0	0	0	0	3	16	12	14	12	0	0	0	57

NORMAL VALUES (1961-1990)

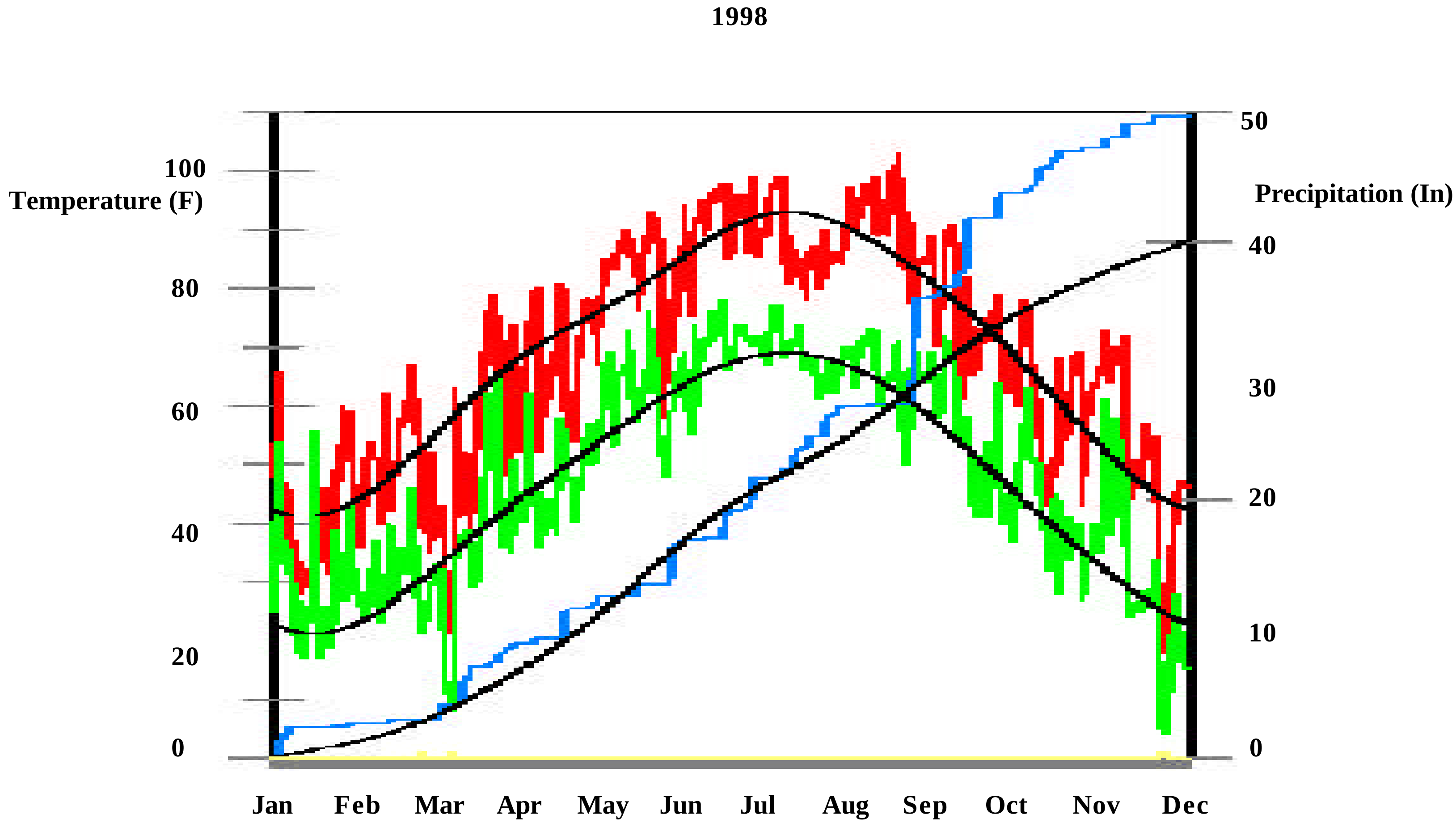
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Avg. Max	40.5	46.6	57.1	68.2	76.8	85.2	91.7	90.1	81.5	71.3	56.8	44.5	67.5
Avg. Min	19.3	24.8	34.2	45.8	55.5	64.1	69.0	66.4	59.1	47.3	35.7	24.8	45.5
Avg. Mean	29.9	35.7	45.7	57.0	66.2	74.7	80.3	78.3	70.3	59.4	46.3	37.0	56.5
Precip	1.32	1.46	3.40	3.80	5.26	4.61	3.15	3.63	4.80	3.92	2.91	1.76	40.02
Snow	2.0	3.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	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	1.7	4.7	-7.5	-3.4	3.7	2.0	-1.9	-0.8	5.9	-1.3	2.1	3.5	0.7
Avg. Min	9.3	7.1	0.0	-1.4	3.5	1.3	2.0	0.8	5.2	1.9	4.0	2.5	3.0
Avg. Mean	5.5	5.9	-3.8	-2.4	3.6	1.6	0.1	-0.1	5.6	0.2	3.0	0.7	1.7
Prcip	1.2	-1.06	1.79	-0.37	-3.3	0.8	1.94	-0.21	4.22	4	0.67	0	9.68
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	-171	-100	132	61	-41	23	0	0	-30	-31	-89	-92	-340
Cool DD	0	0	14	-11	70	67	4	-2	137	-25	2	0	255

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

[1] Assistant Specialist, Weather Data Library, KSU.


1998
100
Temperature (F)
80
60
40
20
0
50
Precipitation (In)
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

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American Cyanamid Co., Wayne, NJ
Bartlett Coop Association
BASF Wyandotte Corp., Parsippany, NJ
Bayer Corp., Kansas City, MO
Cal-West Seeds, Woodland, CA
Dairyland Research International, Clinton, WI
DeKalb Genetics Corp., DeKalb, IL
DeLange Seed Co., Girard, KS
Dow Agro Sciences, Indianapolis, IN
Roger Draeger, Weir, KS
DuPont Agrichemical Co., Wilmington, DE
Elanco Products Co., Greenfield, IN
Farmland Industries, Kansas City, MO
Calvin Flaharty, McCune, KS
FMC Corp., Philadelphia, PA
Forage Genetics, Minneapolis, MN
Ft. Dodge Animal Health, Overland Park, KS
Great Plains Research Co. Inc., Apex, NC
Joe Harris, St. Paul, KS
Harvest Brands, Inc., Pittsburg, KS
Hoffmann-LaRoche, Nutley, NJ
Hubbard Feeds, Inc., Mankato, MN
Johnson Seed Co., Mound Valley, KS
Jones Farm Services, Willard, MO
Kansas Corn Commission, Topeka, KS
Kansas Fertilizer Research Fund, Topeka, KS
Kansas Forage & Grassland Council, Chanute, KS
Kansas Soybean Commission, Topeka, KS
Markley Seed Farms, Dennis, KS
Martin Farms, Columbus, KS
Merial Limited, Rathaway, NJ
Midwest Minerals, Pittsburg, KS
Monsanto Agricultural Products, St. Louis, MO
Moorman Manufacturing Co., Quincy, IL
Mycogen Seeds, St. Paul, MN
Novartis Crop Protection, Greensboro, NC
Novartis Seeds, Inc., Minneapolis, MN
Ohlde Seed Co., Palmer, KS
Parsons Livestock Market, Parsons, KS
Pfizer, Inc., Lee's Summit, MO
Mark Piper, Parsons, KS
Pioneer Hi-Bred International, Johnston, IA
Poli-Tron, Inc., Pittsburg, KS
R & F Farm Supply, Erie, KS
Schering-Plough Animal Health, Union, NJ
SEK Genetics, Galesburg, KS
Wilma Shaffer, Columbus, KS
Joe Smith, Independence, KS
Terra International, Inc., Champaign, IL
Urbana Laboratories, St. Joseph, MO
Valent USA Corp., Walnut Creek, CA
Wilkinson Farms, Pittsburg, KS
Zeneca Ag Products, Wilmington, DE

NOTE

Trade names are used to identify products. No endorsement is intended, nor is any criticism implied of similar products not mentioned.

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- Larry Buffington . . . . Custodial Worker
- Connie Clingan . . . . Office Assistant II
- Larry Ellis . . . . Animal Science Technician I
- TaLana Erikson . . . . Animal Science Technician II
- Terry Green . . . . Animal Science Technician I
- Ronald McNickle . . . . Animal Science Technician II
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