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Contribution No. 04-320-S from the Kansas Agricultural Experiment Station

INTERSEEDING LESPEDEZA INTO CRABGRASS PASTURE VERSUS ADDITIONAL NITROGEN FERTILIZATION ON FORAGE PRODUCTION AND CATTLE PERFORMANCE

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

Summary

Fifty steers grazed wheat-‘Red River’ crabgrass pastures fertilized with additional nitrogen (N) or interseeded with lespedeza in a double-crop grazing system during 2002 and again in 2003. These pastures had been grazed in a wheat-crabgrass double-crop grazing system and broadcast with 2 lb/a of crabgrass during each of the four previous years. In 2002 and 2003, additional crabgrass seed was not planted to determine whether crabgrass would voluntarily reseed itself sufficiently to sustain the system. Legume cover, forage dry-matter production, grazing steer performance, and subsequent feedlot performance were measured. Forage availability, grazing, finishing, and overall performance were similar (P>0.05) in both 2002 and 2003 between steers that grazed pastures fertilized with additional N or pastures interseeded with lespedeza. Steers that grazed pastures interseeded with lespedeza in 2003 had more (P<0.05) efficient feed conversion during the finishing phase than those that grazed pastures fertilized with additional N.

Introduction

Cattlemen in southeastern Kansas, eastern Oklahoma, and western Arkansas need high-quality forages to complement grazing of tall fescue. Complementary forages are especially needed 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 region. Crabgrass could fill this niche by providing high-quality forage for summer grazing. A considerable amount of nitrogen (N) fertilization is required for crabgrass. Adding a legume could reduce the amount of N fertilizer required, enhance the utilization of crabgrass, and extend grazing of high-quality forage in late summer. Crabgrass is an annual and must sufficiently reseed itself on a volunteer basis to provide grazing the following year if it is to be a viable forage in southeastern Kansas. 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, and to determine if crabgrass can sufficiently reseed itself on a volunteer basis to sustain the system.

Experimental Procedures

Pastures

Korean lespedeza was no-till seeded on March 1, 2002, and March 17, 2003, at the rate of 18.5 lb/a and 23 lb/a, respectively, on five of 10 4-acre pastures that had previously been interseeded with lespedeza during each year since 1998. All pastures had originally been seeded with ‘Red River’ crabgrass during the summer of 1997 and no-till seeded with ‘Jagger’ wheat at 121 lb/a and 126 lb/a on September 25, 2001, and October 25, 2002, respectively. All pastures were broadcast with 2 lb/a of crabgrass seed during the spring in 1998, 1999, 2000, and 2001 and were grazed in a

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wheat-crabgrass double-crop system. Additional crabgrass was not seeded in 2002 and 2003 to determine if it could voluntarily reseed itself in a manner sufficient to sustain the system. All pastures were fertilized with 60-55-40 lb/a of N-P_2O_5-K_2O on November 13, 2001; 46 lb/a of N on February 14, 2002; and 48 lb/a of N on May 15, 2002; 81-40-53 lb/a of N-P_2O_5-K_2O on January 31, 2003, and 49 lb/a of N on May 28, 2003. An additional 48 lb/a and 53 lb/a of N were applied to the five pastures without lespedeza on July 1, 2002, and July 21, 2003, respectively.

Available forage was determined at the initiation of grazing and during the season with a disk meter calibrated for crabgrass and for wheat. One exclosure (15-20 ft^2) 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. Lespedeza canopy coverage was estimated from the percentage of the disk circumference that contacted a portion of the canopy.

Cattle

In 2002 and 2003, fifty yearling steers of predominately Angus breeding with initial weights of 665 lb and 633 lb, respectively, were weighed on consecutive days, stratified by weight, and allotted randomly to the 10 pastures on March 7, 2002, and April 2, 2003, to graze out wheat and then graze crabgrass. In 2002, cattle grazed wheat from March 7 until May 7 (61 days) and then grazed crabgrass until September 4 (120 days). In 2003, cattle grazed wheat from April 2 until May 29 (57 days) and then grazed crabgrass until September 10 (104 days). Pastures were stocked initially with 1.2 head/a until the end of the wheat phase, when a steer closest to the pen average weight was removed from each pasture. Pastures were then stocked at l head/a until grazing was terminated, and steers were weighed on September 3 and 4, 2002, and on September 9 and 10, 2003.

Cattle were treated for internal and external parasites before 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.

After the grazing period, cattle were shipped to a finishing facility and fed a diet of 80% ground milo, 15% corn silage, and 5% supplement (dry-matter basis). Cattle that were grazed in 2002 and 2003 were fed for 120 and 93 days, respectively. All steers were implanted with Synovex S® on day 0 of the finishing period. Cattle that were grazed in 2003 were reimplanted with Synovex S® on day 84. 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 (DM) is presented in Figures 1 and 2, for 2002 and 2003, respectively. Available forage was similar between pastures that received additional N fertilizer and those that were interseeded with lespedeza during both years. Available forage in 2003 was greaterer than it was in 2002. This may have been partly because less precipitation fell during the grazing phase in 2002 and the stocking rate closely matched available forage. Lespedeza canopy coverage peaked at 13% on June 24 in 2002 and 7% on August 20 in 2003.

Cattle Performance

Performance of steers that grazed crabgrass pastures either fertilized with additional N or interseeded with lespedeza are shown in Table 1. Cattle that grazed pastures fertilized with additional N and those interseeded with lespedeza had similar ($P>0.05$) grazing weight gains during the wheat phase, crabgrass phase, and overall during both years.

In 2002, gains during the wheat phase averaged 3.05 and 2.94 lb/head/day, gains during the crabgrass phase averaged 1.72 and 1.58 lb/head/day, and overall grazing gains averaged 2.17 and 2.03 lb/head/day for pastures fertilized with additional N and pastures interseeded with lespedeza, respectively. Gain per acre averaged 233 and 224 lb during the wheat phase, 207 and 189 lb during the crabgrass phase, and 440 and 413 lb overall for pastures fertilized with additional N and pastures interseeded with lespedeza, respectively. Crabgrass gains were likely limited by forage availability due to below-normal precipitation during the summer months.

In 2003, gains during the wheat phase averaged 2.85 and 2.77 lb/head/day, gains during the crabgrass phase averaged 1.64 and 1.55 lb/head/day, and overall grazing gains averaged 2.07 and 1.98 lb/head/day for pastures fertilized with additional N and pastures interseeded with lespedeza, respectively. Gain per acre averaged 203 and 197 lb during the wheat phase, 171 and 161 lb during the crabgrass phase, and 374 and 358 lb overall for pastures fertilized with additional N and pastures interseeded with lespedeza, respectively.

Finishing gains, carcass characteristics, and overall gains were similar ($P>0.05$) between treatments during both years. Finishing gains averaged 3.67 and 3.62 lb/head/day and overall gains (grazing + finishing) averaged 2.75 and 2.64 lb/head/day for steers that had previously grazed pastures fertilized with additional N and pastures interseeded with lespedeza, respectively, in 2002. Two steers that had previously grazed the lespedeza treatment in 2002 were removed from the study during the finishing phase for reasons unrelated to experimental treatment. Finishing gains averaged 3.59 and 3.83 lb/head/day and overall gains (grazing + finishing) averaged 2.63 and 2.65 lb/head/day for steers that had previously grazed pastures fertilized with additional N and pastures interseeded with lespedeza, respectively, in 2003. Previous grazing treatment had no effect ($P>0.05$) on finishing performance or carcass characteristics except that steers that had previously grazed pastures interseeded with lespedeza in 2003 were 8.3% more ($P<0.05$) efficient in feed conversion during the finishing phase than were steers that had grazed pastures fertilized with additional N.

Grazing and finishing performance were similar ($P>0.05$) between steers that grazed pastures fertilized with additional N or pastures interseeded with lespedeza. Cattle performance and gain per acre were similar to those measured during the previous three years when crabgrass was seeded each year.

This study will be continued for at least one more grazing season with no additional crabgrass seed being sown to determine if the crabgrass will reseed itself in a manner sufficient to sustain the system.

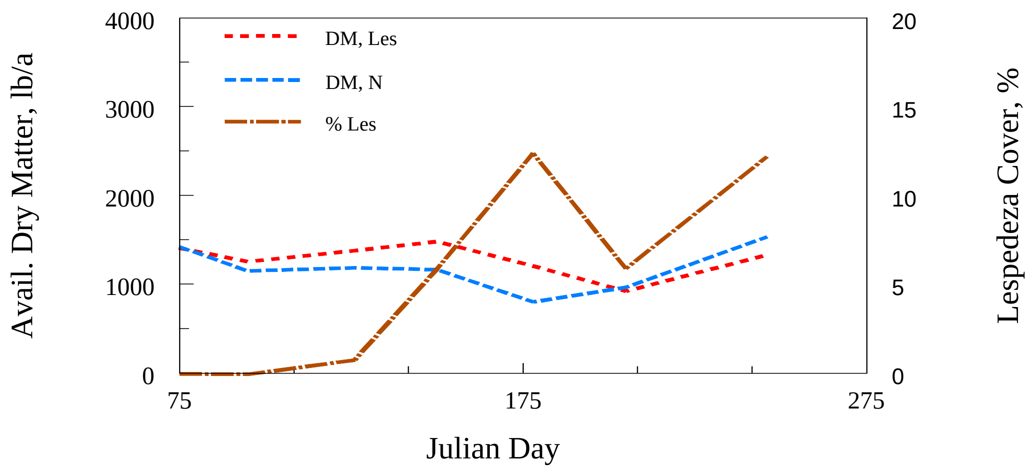

Figure 1. **Available Forage and Lespedeza Canopy Cover in Wheat and Crabgrass Pastures, 2002, Southeast Agricultural Research Center.**

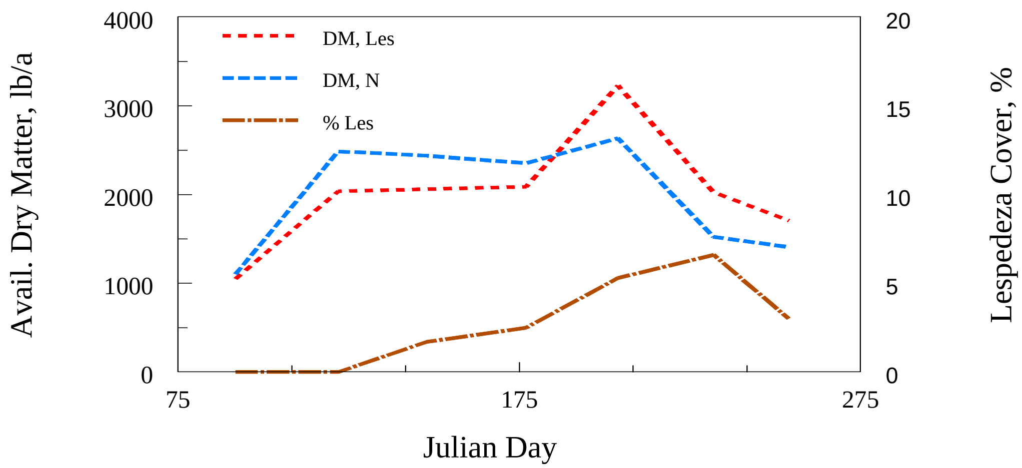

Figure 2. **Available Forage and Lespedeza Canopy Cover in Wheat and Crabgrass Pastures, 2003, Southeast Agricultural Research Center.**

Table 1. Effect of Interseeding Lespedeza vs. Nitrogen Fertilization on Average Performance of Steers Grazing Crabgrass Pastures, Southeast Agricultural Research Center, 2002-2003.

Item	2002 Nitrogen	2002 Lespedeza	2003 Nitrogen	2003 Lespedeza
Grazing Phase - Wheat				
No. of days	61	61	57	57
No. of head	15	20	15	20
Initial wt., lb	665	665	632	633
Ending wt., lb	851	844	795	790
Gain, lb	186	179	163	158
Daily gain, lb	3.05	2.94	2.85	2.77
Gain/a, lb	233	224	203	197
Grazing Phase - Crabgrass				
No. of days	120	120	104	104
No. of head	12	16	12	16
Initial wt., lb	849	842	796	789
Ending wt., lb	1056	1031	966	950
Gain, lb	207	189	171	161
Daily gain, lb	1.72	1.58	1.64	1.55
Gain/a, lb	207	189	171	161
Overall Grazing Performance (Wheat + Crabgrass)				
No. of days	181	181	161	161
Gain, lb	393	368	333	319
Daily gain, lb	2.17	2.03	2.07	1.98
Gain/a, lb	440	413	374	358
Finishing Phase				
No. of days	118	118	93	93
No. of head	12	14	12	16
Initial wt., lb	1056	1030	966	950
Ending wt., lb	1490	1456	1300	1306
Gain, lb	434	427	334	356
Daily gain, lb	3.67	3.62	3.59	3.83
Daily DM intake, lb	28.5	27.6	26.6	26.3
Feed/gain	7.76	7.63	7.44[a]	6.87[b]
Hot carcass wt., lb	895	871	765	772
Dressing %	60.1	59.8	58.9	59.1
Backfat, in	.60	.56	.45	.48
Ribeye area, in^2	12.4	12.8	11.8	11.8
Yield grade	3.7	3.5	3.2	3.3
Marbling score	SM^{45}	SM^{34}	SM^{22}	SM^{55}
% Choice	92	86	67	75
Overall Performance (Grazing + Finishing Phase)				
No. of days	299	299	254	254
Gain, lb	825	791	668	674
Daily gain, lb	2.75	2.64	2.63	2.65

[a,b]Means within a row within the same year with the same letter are not significantly different (P<0.05).

EFFECTS OF GRAIN SORGHUM SUPPLEMENTATION OF STEERS AND HEIFERS GRAZING SMOOTH BROMEGRASS PASTURES ON GRAZING PERFORMANCE AND SUBSEQUENT FINISHING PERFORMANCE

Lyle W. Lomas and Joseph L. Moyer

Summary

Twenty-four steer calves and 12 heifer calves in 2002 and 36 steer calves in 2003 were used to evaluate the effect on grazing performance and subsequent finishing performance from grain sorghum supplementation of calves grazing smooth bromegrass. In both 2002 and 2003, cattle supplemented with 4 lb of grain sorghum per head daily had greater ($P<0.05$) grazing gain than those that received no supplement; 2 lb of supplement per head daily resulted in no significant ($P>0.05$) improvement in grazing gain. Average forage availability was not affected ($P>0.05$) by supplementation in 2002 or 2003, but was affected ($P<0.05$) on two sampling dates in 2003. Supplementation during the grazing phase had no effect ($P>0.05$) on finishing performance or overall cattle weight gain.

Introduction

Supplementation of grazing stocker cattle is an effective way to increase gains of cattle on pasture. The decision of whether or not to provide supplement to grazing cattle may depend on several factors, including pasture conditions, supplement cost, anticipated selling price, cattle weight, and expected selling date. Although supplementation will improve grazing gains in most instances, the effect of supplementation on available forage during the grazing phase and the effects on subsequent finishing performance and carcass characteristics are not clearly documented. The purpose of this study was to evaluate the effects of grain sorghum supplementation on forage availability, grazing performance, and subsequent finishing performance.

Experimental Procedures

Twenty-four steer calves and twelve heifer calves of predominately Angus breeding in 2002 and thirty-six steer calves in 2003 with initial average weights of 552, 472, and 569 lb, respectively, were weighed on consecutive days, stratified by weight within sex, and allotted randomly to nine 5-acre smooth bromegrass pastures on April 25, 2002 and April 29, 2003. All animals were of predominately Angus breeding. Two pastures of steers and one pasture of heifers were randomly assigned to one of three supplementation treatments and were grazed for 188 days in 2002. Three pastures of steers were randomly assigned to one of three supplementation treatments and were grazed for 199 days in 2003. Supplementation treatments were 0, 2, or 4 lb of ground grain sorghum/head daily. Cattle were weighed, forage samples were collected, and forage availability was measured approximately every 28 days with a disk meter calibrated for smooth bromegrass. Grazing was terminated and cattle were weighed on October 29 and 30 and November 12 and 13 in 2002 and 2003, respectively.

Cattle were treated for internal and external parasites before being turned out to pasture and later were vaccinated for protection from pinkeye. Cattle had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt.

After the grazing period, cattle were shipped to a finishing facility and fed a diet of 80% ground milo, 15% corn silage, and 5% supplement (dry-matter basis) for 120 days and 99 days in 2002 and 2003, respectively. Steers were implanted with Synovex S® and heifers were implanted with Ralgro® on days 0 and 84 of the finishing period in 2002. In 2003, steers were implanted with Synovex S® once on day 0. Cattle were slaughtered in a commercial facility at the end of the finishing period and carcass data were collected.

Results and Discussion

Forage availability during the grazing phase is presented in Tables 1 and 2 for 2002 and 2003, respectively. In 2002, there were no significant ($P>0.05$) differences in pasture forage availability as a result of supplementation treatment or gender on any of the evaluation dates. In 2003, forage availability was greater ($P<0.05$) in pastures with cattle supplemented with 4 lb of grain sorghum per head daily on May 28 and in pastures with cattle supplemented with 2 lb of grain sorghum per head daily on November 13. Average forage availability over the entire grazing season was not affected ($P>0.05$) by supplementation in 2002 or 2003. In 2002, forage availability peaked on May 29 and was least on October 29. In 2003, forage availability peaked on May 28 and was least on November 13.

Crude protein content from pasture forage samples is reported in Table 2 for 2003. Forage protein content was greatest on April 30 (17.9%) and least on June 25 (7.4%), but after June 25 tended to increase to the end of the grazing season. The drastic decrease in protein content observed from April 30 to May 28 and June 25 was likely caused at least in part by the presence of seed heads in the May and June samples.

Cattle performance is presented in Tables 3 and 4 for 2002 and 2003, respectively. One steer was removed from the 2-lb supplementation group near the end of the grazing phase in 2003 for reasons unrelated to experimental treatment. In 2002 and 2003, respectively cattle fed 4 lb of grain sorghum per head daily gained 0.3 lb and .25 lb more ($P<0.05$) per day and produced 45 lb and 40 lb more ($P<0.05$) grazing gain per acre than those that received no supplement. Supplementation with 2 lb of grain sorghum per head daily resulted in no significant ($P<0.05$) improvement in grazing performance over the unsupplemented control in either year.

Supplementation during the grazing phase had no effect ($P>0.05$) on finishing gain or overall gain in either 2002 or 2003. In 2002, cattle supplemented with 4 lb of grain sorghum per head daily during the grazing phase were heavier at the end of the finishing phase than those supplemented with 0 or 2 lb per head daily, although this difference was not significant ($P>0.05$). Cattle that received no supplement during the grazing phase seemingly made some compensatory gain in the feedlot. Cattle supplemented with 4 lb of grain sorghum per head daily during the grazing phase had higher ($P<0.05$) marbling scores than those that received 0 or 2 lb of supplement. Marbling score was lower ($P<0.05$) for cattle supplemented with 2 lb of supplement than for those supplemented with 0 or 4 lb per head daily. In 2003, steers supplemented with 4 lb during the grazing phase were heavier ($P<0.05$) at the end of the finishing phase and had heavier ($P<0.05$) hot-carcass weights than those that were not supplemented while grazing. This was likely because steers supplemented with 2 lb had a higher initial starting weight as the result of a lightweight steer being removed from the study. No other differences ($P>0.05$) in finishing or overall performance were observed in steers grazed in 2003.

Although the steers were heavier ($P<0.05$) than the heifers in 2002 at both the beginning and ending of the grazing phase, grazing gains of steers and heifers were similar ($P<0.05$). During the finishing phase, steers had greater ($P<0.05$) gains, consumed more ($P<0.05$) feed, had smaller ($P<0.05$) feed/gain, had heavier ($P<0.05$) carcasses, and greater ($P<0.05$) overall gains than heifers. Heifers had a larger ($P<0.05$) dressing percentage and greater ($P<0.05$) marbling scores than steers.

In summary, supplementation with 4 lb of grain sorghum/head/day improved ($P<0.05$) performance during the grazing phase, but had no effect ($P>0.05$) on finishing or overall performance. Supplementation with 2 lb of grain sorghum per head daily resulted in similar ($P>0.05$) performance to feeding no supplement. On the basis of these data, a producer who was going to background cattle and sell them at the end of the grazing period might want to consider supplementation with 4 lb of grain sorghum per head daily. If the producer planned to retain ownership of the cattle through slaughter, there would be little or no advantage to supplementation during the backgrounding phase.

Table 1. Effect of Grain Sorghum Supplementation on Forage Availability for Steers and Heifers Grazing Smooth Bromegrass Pastures, Southeast Agricultural Research Center, 2002.

	Forage Availability (lb/acre)				
	Grain Sorghum (lb/head/day)			Sex	
Date	0	2	4	Steers	Heifers
April 25	3109	3546	3309	3451	3191
May 29	4234	4266	4251	4625	3876
June 27	2936	2798	2963	2907	2891
July 24	2292	2307	2460	2311	2395
August 27	1830	1699	1762	1658	1870
September 26	1502	1497	1614	1565	1510
October 29	1145	1055	987	1013	1112
Average	2436	2452	2478	2504	2406

Table 2. Effect of Grain Sorghum Supplementation on Forage Availability for Steers Grazing Smooth Bromegrass Pastures, Southeast Agricultural Research Center, 2003.

	Forage Availability (lb/acre)				
	Grain Sorghum (lb/head/day)				
Date	0	2	4	Average	Crude Protein (%)
April 30	5409	4835	5623	5289	17.9
May 28	4757[a]	5169[a]	6721[b]	5549	9.5
June 25	3581	3866	3451	3633	7.4
July 22	2751	2609	2845	2735	11.0
August 19	2162	2220	2382	2254	10.8
September 15	2048	2278	2162	2163	12.5
October 15	1562	1637	1633	1611	15.5
November 13	1202[a]	1371[b]	1151[a]	1241	13.1
Average	2934	2998	3246	3059	12.2

[a,b]Means within a row with the same letter are not significantly different (P<0.05).

Table 3. Effect of Grain Sorghum Supplementation of Steers and Heifers Grazing Smooth Bromegrass Pastures on Average Grazing Performance and Subsequent Finishing Performance, Southeast Agricultural Research Center, 2002.

	Grain Sorghum (lb/head/day)			Sex	
Item	0	2	4	Steers	Heifers
Grazing Phase (188 days)					
No. of head	12	12	12	24	12
Initial wt., lb	512	512	512	552[a]	472[b]
Ending wt., lb	822[c]	844	879[d]	897[a]	800[b]
Gain, lb	310[c]	332	366[d]	345	328
Daily gain, lb	1.65[c]	1.77	1.95[d]	1.83	1.74
Gain/acre, lb	248[c]	266	293[d]	276	262
Finishing Phase (112 days)					
Initial wt., lb	822[c]	844	879[d]	897[a]	800[b]
Ending wt., lb	1214	1217	1254	1320[a]	1136[b]
Gain, lb	392	373	375	424[a]	336[b]
Daily gain, lb	3.50	3.33	3.35	3.78[a]	3.00[b]
Daily DM intake, lb	25.8	25.6	25.2	26.9[a]	24.2[b]
Feed/gain	7.46	7.76	7.57	7.12[a]	8.07[b]
Hot carcass wt., lb	720	746	749	780[a]	696[b]
Dressing %	59.4	61.4	59.8	59.0[a]	61.3[b]
Backfat, in	.39	.47	.45	.41	.46
Ribeye area, in^2	12.1	11.9	12.4	12.3	11.9
Yield grade	2.7	3.1	3.0	2.9	2.9
Marbling score	SM[51c]	SM[28d]	SM[74e]	SM[28a]	SM[74b]
% Choice	94	69	94	71	100
Overall Performance (Grazing + Finishing) (300 days)					
Gain, lb	702	705	741	768[a]	664[b]
Daily gain, lb	2.34	2.35	2.47	2.56[a]	2.21[b]

[a,b] Gender means within a row with the same letter are not significantly different ($P<0.05$).
[c,d,e] Supplementation level means within a row with the same letter are not significantly different ($P<0.05$).

Table 4. Effect of Grain Sorghum Supplementation of Steers Grazing Smooth Bromegrass Pastures on Average Grazing Performance and Subsequent Finishing Performance, Southeast Agricultural Research Center, 2003.

Item	Grain Sorghum (lb/head/day)		
	0	2	4
Grazing Phase (198 days)			
No. of head	12	11	12
Initial wt., lb	569	582	569
Ending wt., lb	919	969	968
Gain, lb	350[a]	387	400[b]
Daily gain, lb	1.77[a]	1.96	2.02[b]
Gain/acre, lb	280[a]	310	320[b]
Finishing Phase (99 days)			
Initial wt., lb	919	969	968
Ending wt., lb	1307[a]	1355[b]	1326
Gain, lb	388	385	357
Daily gain, lb	3.92	3.89	3.61
Daily DM intake, lb	29.0	28.0	28.0
Feed/gain	7.40	7.22	7.77
Hot carcass wt., lb	752[a]	795[b]	775
Dressing %	57.5	58.7	58.4
Backfat, in	.43	.47	.49
Ribeye area, in^2	12.8	13.3	13.3
Yield grade	2.7	2.8	2.8
Marbling score	SM^{04}	SM^{27}	SM^{45}
% Choice	58	75	75
Overall Performance (Grazing + Finishing) (297 days)			
Gain, lb	738	773	757
Daily gain, lb	2.48	2.60	2.55

[a,b] Means within a row with the same letter are not significantly different ($P<0.05$).

ALFALFA VARIETY PERFORMANCE IN SOUTHEASTERN KANSAS

Joseph L. Moyer

Summary

A 13-line test seeded in 2001 was cut five times in 2003. Yields did not differ (P>0.20), ranging from 6.00 to 5.44 tons/a. Three-year total production was greater (P<0.05) from '6420' and 'Dagger+EV', than from 'Kanza', 'Perry', '350', and 'Rebound 4'. In the 28-line test seeded in 1998, stands of CW 5426 Exp. were better in fall, 2003 than eight other cultivars.

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

A 13-line test was seeded (15 lb/a) on May 9, 2001 at the Mound Valley Unit (Parsons silt loam) after preplant fertilization with 20-50-200 lb/a of N-P_2O_5-K_2O. Plots were treated for weed control with 1 pt/a of Poast® on June 19 and 2 qt/a of Butyrac® on July 2, and for webworm infestation on August 9 with malathion. In 2002, plots were fertilized as before on February 22, sprayed with 1.5 pt/a of Lorsban® to control weevil, with 1.5 pt/a of Poast® to control grass, and harvested three times.

In 2003, plots were fertilized on February 12 with 20-50-200 lb/a of N-P_2O_5-K_2O. Alfalfa was cut on April 23 to avoid excessive damage from a late-developing weevil infestation, and stubble was treated with 2 pt/a of Lorsban®. The next three harvests were taken on June 4 and July 2 and 24. After a summer drought, fall moisture was adequate to produce a cutting on November 7 (see weather summary).

Results and Discussion

Yields of the first cutting in 2003 did not differ among cultivars, but second-cut yields were significantly (P<0.05) greater from 6420, 'WL 327', and 'Pawnee' than from Kanza (Table 1). Third-cut yield was greater from '54V54' than from Perry. Fourth-cut yields were greater for WL 327 than for '400SCL' and Perry. Drought prevented regrowth until November 7, when 6420, Dagger+EV, and '5-Star' yielded more than 350 and Kanza (Table 1).

For 2003, total yields of the 13 entries were similar (Table 2). Total 3-year yields of 6420 and Dagger+EV, were greater than those of Kanza, Perry, 350, and Rebound 4. Yield of 6420 was also greater than that of '400SCL'. Yields of WL 327 and 'HybriForce-400' were greater than those of Kanza and Perry, with the former also greater than yield of 350. Statewide alfalfa performance test results can be found at http://www.ksu.edu/kscpt/.

Final stand ratings for the variety test seeded in 1998 are listed in Table 3, along with yields for the last tested year, 2001, and for the total of four years of testing. Stands after six seasons were better (P<0.05) for CW 5426 Exp. than for eight other cultivars. The stand of WL 325 HQ was poorer than stands of five entries (Table 3).

Table 1. Forage Yields (tons/a @ 12% moisture) for Five Cuttings in 2003 for the 2001 Alfalfa Variety Test, Mound Valley Unit, Southeast Agricultural Research Center.[1]

Source	Entry	4/23	6/4	7/2	7/24	11/7
AgriPro Biosciences, Inc	Dagger + EV	1.68[a]	2.02[a,b]	0.86[a,b]	0.51[a,b]	0.90[a]
Allied	350	1.70[a]	1.93[a,b]	0.85[a,b]	0.44[a,b]	0.60[c]
Allied	400SCL	1.62[a]	2.02[a,b]	0.79[b,c]	0.43[b]	0.86[a,b]
Croplan Genetics	5-Star	1.60[a]	1.91[a,b]	0.82[a,b]	0.50[a,b]	0.89[a]
Croplan Genetics	Rebound 4.2	1.72[a]	2.02[a,b]	0.82[a,b]	0.45[a,b]	0.77[a,b]
Dairyland	HybriForce-400	1.65[a]	1.93[a,b]	0.77[b,c]	0.46[a,b]	0.80[a,b]
Garst Seed	6420	1.72[a]	2.04[a]	0.78[b,c]	0.48[a,b]	0.91[a]
Midwest Seed	Pawnee	1.79[a]	2.03[a]	0.83[a,b]	0.47[a,b]	0.78[a,b]
Pioneer	54V54	1.64[a]	1.94[a,b]	0.90[a]	0.48[a,b]	0.78[a,b]
W-L Research	WL 327	1.80[a]	2.04[a]	0.86[a,b]	0.53[a]	0.79[a,b]
W-L Research	WL 342	1.61[a]	2.02[a,b]	0.83[a,b]	0.48[a,b]	0.81[a,b]
Kansas AES & USDA	Kanza	1.66[a]	1.81[b]	0.78[b,c]	0.50[a,b]	0.70[b,c]
Nebraska AES & USDA	Perry	1.77[a]	1.85[a,b]	0.68[c]	0.43[b]	0.85[a,b]
Average		1.69	1.96	0.81	0.47	0.80

[1] Means within a column followed by the same letter are not significantly (P<0.05) different.

Table 2. Forage Yields (tons/a @ 12% moisture) for 2001-2003 in the 2001 Alfalfa Variety Test, Mound Valley Unit, Southeast Agricultural Research Center.[1]

Source	Entry	2001	2002	2003	3-Yr Total
AgriPro Biosciences, Inc	Dagger + EV	1.44[a]	5.86[a,b]	5.97[a]	13.27[ab]
Allied	350	1.30[a,b,c]	5.44[b]	5.51[a]	12.26[d,e]
Allied	400SCL	1.16[b,c]	5.64[a,b]	5.70[a]	12.41[b,c,d,e]
Croplan Genetics	5-Star	1.36[a,b,c]	5.58[a,b]	5.72[a]	12.66[a,b,c,d,e]
Croplan Genetics	Rebound 4.2	1.14[c]	5.43[b]	5.77[a]	12.34[c,d,e]
Dairyland	HybriForce-400	1.40[a,b]	6.13[a]	5.60[a]	13.13[a,b,c,d]
Garst Seed	6420	1.39[a,b,c]	6.11[a]	5.92[a]	13.42[a]
Midwest Seed	Pawnee	1.40[a,b]	5.37[b]	5.89[a]	12.64[a,b,c,d,e]
Pioneer	54V54	1.34[a,b,c]	5.51[a,b]	5.74[a]	12.59[a,b,c,d,e]
W-L Research	WL 327	1.26[a,b,c]	5.75[a,b]	6.00[a]	13.26[a,b,c]
W-L Research	WL 342	1.25[a,b,c]	5.80[a,b]	5.74[a]	12.78[a,b,c,d,e]
Kansas AES & USDA	Kanza	1.15[c]	5.33[b]	5.44[a]	11.93[e]
Nebraska AES & USDA	Perry	1.29[a,b,c]	5.35[b]	5.57[a]	12.22[e]
Average		1.31	0.80	5.74	12.71

[1] Means within a column followed by the same letter are not significantly (P<0.05) different.

Table 3. Forage Yields (tons/a @ 12% moisture) in 2001, 4-Year Total Yields, and Final Stand Ratings for the 1998 Alfalfa Variety Test, Mound Valley Unit, Southeast Agricultural Research Center.

Source	Entry	Forage Yield 2001	Forage Yield Total, 1998-2001	Stand Rating[1]
		- - tons/a @ 12% moisture - -		- 0 to 5 -
AgriPro Biosciences, Inc	ZC9750A	4.58	19.12	3.2
AgriPro Biosciences, Inc.	ZC9751A	4.90	19.84	3.0
AgriPro Biosciences, Inc.	ZC9651	4.69	19.32	3.2
AgriPro Biosciences, Inc.	AMERIGRAZE 401+Z	4.66	19.70	3.2
AgriPro Biosciences, Inc.	EMPEROR	4.53	19.58	3.0
AgriPro Biosciences, Inc.	ZC 9650	4.52	19.20	3.2
ALLIED - STAR	SENDERO	4.39	19.16	2.8
ALLIED - STAR	SPUR	4.46	18.74	2.8
ALLIED - STAR	STAMINA	4.54	19.38	2.8
CAL/WEST Seeds	CW 5426 Exp.	4.66	19.10	4.0
CAL/WEST Seeds	CW 6408 Exp.	4.46	18.89	3.5
CAL/WEST Seeds	CW 74013 Exp.	4.62	19.50	3.2
CAL/WEST Seeds	CW 74031 Exp.	4.69	19.31	2.8
CAL/WEST Seeds	CW 74034 Exp.	4.68	19.28	3.2
CAL/WEST Seeds	CW 75044 Exp.	4.60	18.89	3.8
CAL/WEST Seeds	GOLD PLUS	4.46	18.70	2.8
DAIRYLAND	DS9612	4.74	19.80	3.0
DAIRYLAND - MBS	PROGRO	4.73	19.74	3.5
DEKALB Plant Genetics	DK 141	4.58	19.58	3.2
DEKALB Plant Genetics	DK142	4.58	19.18	3.2
GARST SEED	631	4.48	19.32	3.0
Germains	WL 324	4.68	19.86	2.8
Germains	WL 325 HQ	4.56	18.46	2.2
Germains	WL 326 GZ	4.62	19.72	3.2
Great Plains Research	CIMARRON 3i	4.10	19.79	3.0
PIONEER	54H55	4.67	19.82	3.0
Kansas AES and USDA	Kanza	4.67	19.32	2.8
Nebraska AES and USDA	Perry	4.63	19.30	3.5
	Average	4.59	19.34	3.1
	LSD(0.05)	0.32	0.82	1.1

[1] Stand rating, where 0=no stand and 5=100% stand.

EVALUATION OF TALL FESCUE CULTIVARS

Joseph L. Moyer

Summary

Ten tall fescue cultivars seeded in fall, 1999, and 11 seeded in fall, 2001 were harvested in May and December, 2003. In the 1999 trial, 'Ga-5' and 'Fuego' produced more forage than 'Ky 31' EF. In the 2001 trial, fall production of 'Q 4508' was more than that of any of five other entries.

Introduction

Tall fescue (*Festuca arundinacea* Schreb.) is the most widely grown forage grass in southeastern Kansas. The abundance of this cool-season perennial grass is due largely to its vigor and tolerance to the extremes in climate and soils of the region. Tolerance of the grass to stresses and heavy use is partly attributable to its association with a fungal endophyte, *Neotyphodium coenophialum* (Morgan-Jones and Gams) Glenn, Bacon, and Hanlin, but most ubiquitous endophytes are also responsible for the production of substances toxic to some herbivores, including cattle, sheep, and horses.

Recent research efforts have identified endophytes that purportedly lack toxins but augment plant vigor. Such endophytes have been inserted into tall fescue cultivars adapted to the United States and are represented in this test. Other cultivars are either fungus-free or contain a ubiquitous form of the endophyte. Such combinations need to be tested in this western fringe of the United States' tall fescue belt.

Experimental Procedures

A 10-line test was seeded with a cone planter in 10-inch rows by using 19 lb/a of pure, live seed on September 9, 1999 at the Mound Valley Unit, Southeast Agricultural Research Center. Each plot was 30 ft x 5 ft, and plots were arranged in four randomized complete blocks. Soil was a Parsons silt loam (Mollic albaqualf). An adjacent set of plots was seeded September 25, 2001 by using the same procedure.

Fertilizer to supply 150-50-60 lb/a of N-P_2O_5-K_2O was applied to all plots on February 12, 2003. A 3-ft x 20-ft area was harvested from each plot to a 3-in. height with a flail-type harvester and grass was weighed on May 12, 2003, after all plots were headed. A forage subsample was collected and dried at 140 ^{0}F for moisture determination and forage was removed from the rest of the plot at the same height. Fall regrowth was harvested on December 8, 2003.

Results and Discussion

Forage yield of the 1999 trial in spring was similar ($P>0.10$) for all entries (Table 1). Fall production of 'AU Triumph' was greater than that of any of four other entries, including 'Select' and Ky 31 EF. Yield for 2003 was greater ($P<0.05$) for Ga-5 and Fuego than for Ky 31 EF. Total yield for the past 3 years was greater for Fuego and 'Jesup' NE than for 'FA 102' (Table 1).

Forage yield of the 2001 trial in spring was similar ($P>0.10$) for all entries (Table 2). This was despite Ky 31 HE having a significantly ($P<0.05$) lower stand rating than all other entries. Q 4508 also had a better stand rating than 'R 4663'. Fall production of Q 4508 and 'CIS-FTF-2' were greater than that of any of four other entries, including Ky 31 HE and 'HiMag' E- (Table 2). The lesser yield of the former may be partly because of its poorer stand.

Table 1. Forage Yield in 2003 of Tall Fescue Cultivars Seeded in 1999, Mound Valley Unit, Southeast Agricultural Research Center.

	Forage Yield			
Cultivar	5/12	12/8	2003 Total	3-Yr Total
	- - - - - - - - - - tons/a@12% moisture - - - - - - - - - -			
FA 102 EF[1]	3.08	1.42	4.49	6.27
Jesup NETF[2]	3.02	1.48	4.50	7.13
Ga-5 NETF[2]	3.22	1.52	4.74	6.77
AU Triumph	2.92	1.72	4.62	6.41
Fuego LE[3]	3.06	1.62	4.67	7.02
Seine EF	2.98	1.46	4.44	7.00
Select EF	3.12	1.32	4.44	7.00
Ky 31 EF	2.76	1.36	4.12	7.22
Ky 31 HE[3]	2.85	1.44	4.29	7.17
MV 99 EF	3.00	1.48	4.48	7.09
Average	3.00	1.47	4.47	6.91
LSD(0.05)	NS	0.24	0.50	0.47

[1]EF=Endophyte-free.
[2]Contains proprietary novel endophyte.
[3]LE= Low-endophyte seed (0-2% infected); HE=High-endophyte seed (80% infected).

Table 2. Forage Yield in 2003 of Tall Fescue Cultivars that were Seeded in 2001, Mound Valley Unit, Southeast Agricultural Research Center.

Cultivar	Forage Yield 5/12	Forage Yield 12/8
	- - - - - tons/a@12% moisture - - - -	
CIS-FTF-1	3.65	1.55
CIS-FTF-2	3.65	1.91
AU Triumph	3.69	1.71
Martin 2	3.58	1.82
Cajun 2	3.46	1.68
HiMag EF [1]	3.50	1.47
ArkPlus [2]	3.59	1.52
Q 4508	3.62	1.97
R 4663	3.38	1.63
Ky 31 HE [3]	3.71	1.41
Ky 31 LE [3]	3.92	1.78
Average	3.61	1.67
LSD(0.05)	NS	0.30

[1]EF=Endophyte-free.
[2]Contains proprietary novel endophyte.
[3]LE= Low-endophyte seed (0-2% infected); HE=High-endophyte seed (80% infected).

EVALUATION OF ANNUAL LESPEDEZA CULTIVARS

Joseph L. Moyer and Gary L. Kilgore

Summary

Four annual lespedezas were harvested for forage production in 2003, after testing for forage and seed production in 2002. Forage yield in 2003 averaged 2.1 tons/a, with no significant (P>0.10) difference among cultivars. Two-year average yields, however, were greater (P<0.05) for common Korean than for ‘Marion’ or ‘Legend’. Forage crude protein in 2003 was similar among cultivars.

Introduction

The annual lespedezas are the only group of legumes grown primarily for forage in the United States that is truly warm-season in adaptation. The two primary species are Korean lespedeza (*Lespedeza stipulacea* Maxim.) and striate lespedeza (*L. striata* Hook. and Arn.). The annual lespedezas are used for seeding in small grain rotations, and as a supplement to cool- and warm-season perennial grass pastures. Poor yield relative to other forage species has resulted in a decline of importance during the past several decades, but recent releases may have improved forage yield and/or quality.

Experimental Procedures

A four-line test was seeded with a cone planter in 10-in. rows by using 20 lb/a of pure, live seed on April 17, 2002, and April 23, 2003, at the Mound Valley Unit, Southeast Agricultural Research Center. All of the entries except common Korean were of the striate type. In 2003, each plot was 30 ft x 5 ft and plots were arranged in four randomized complete blocks. Soil was a Parsons silt loam (Mollic albaqualf). Fertilizer to supply 20-50-200 lb/a of N-P_2O_5-K_2O was applied to all plots before planting. Plots were treated with 1 lb/acre a.i. of 2,4-DB on June 7 and 0.2 lb/acre a.i of sethoxydim with surfactant in early July.

A 3-ft x 20-ft area was harvested from each plot to a 2-in. height with a flail-type harvester, and forage was weighed on August 19, 2003, before leaves were lost from drought stress. A forage subsample was collected and dried at 140 ^{0}F for moisture and crude protein determination.

Results and Discussion

Forage yield of the four entries averaged 2.1 tons/a with no significant (P>0.10) difference among cultivars (Table 1). When averaged over the two years, however, common Korean lespedeza produced more (P<0.05) forage than Marion or Legend; yield of ‘Kobe’ was intermediate.

There was no significant (P>0.10) difference among cultivars for forage crude protein concentration (Table 1). In summary, common Korean was evidently as good as the striate lespedeza cultivars tested for forage and seed yield and forage crude protein.

Table 1. Forage Yield in 2003 and 2-Year Average, and 2003 Forage Crude-Protein Concentration of Annual Lespedeza Cultivars, Mound Valley Unit, Southeast Agricultural Research Center.

Cultivar	Forage Yield[1] 2003	Forage Yield[1] 2-Yr Average	Crude Protein
	- - - - - - - tons/acre	- - - - - - -	- - % - -
Common Korean	2.60[a,2]	3.21[a,3]	12.3[a,2]
Legend	1.96[a]	2.57[b]	11.8[a]
Kobe	2.00[a]	2.68[a,b]	11.7[a]
Marion	1.98[a]	2.41[b]	11.3[a]
Average	2.13	2.72	11.8

[1] 12% moisture basis.
[2] Means within a column followed by the same letter are not significantly (P<0.10) different, according to multiple t-tests.
[3] Means within a column followed by the same letter are not significantly (P<0.05) different, according to multiple t-tests.

FORAGE PRODUCTION OF BERMUDAGRASS CULTIVARS IN EASTERN KANSAS

Joseph L. Moyer, Keith Janssen[1], Kenneth W. Kelley, and Charles M. Taliaferro[2]

Summary

Plot coverage in Ottawa in early summer, 2003 was better for 'Greenfield', 'Midland 99', and 'Wrangler' than for 'CD 90160', 'Midland' and 'LCB84x16-66'. Yields for 2003 were greater ($P<0.05$) for 'LCB84x19-16', 'Ozark', 'LCB84x16-66', and Midland 99 than for any of the other entries. At Columbus, early-summer coverage for sprigged plots in 2003 was better for 'Guymon' than for CD 90160, Ozark, Midland, and LCB84x16-66. Total yields for 2003 were highest for 'Midland 99'. Five entries yielded less than the top three. Three-year total yields were better for Midland 99, Ozark, and LCB84x19-16 than for any of the other entries. Seeded plot yields in 2003 of Wrangler were greater than yields of CD 90160. Total 3-year production was similar for the three entries, but plots of CD 90160 contained weedier forage.

Introduction

Bermudagrass can be a high-producing, warm-season perennial forage for eastern Kansas when not affected by winterkill. Producers in southeastern Kansas have profited from the use of more winter-hardy varieties that produced more than common bermudas. Seeded types may offer cost savings or other advantages in marginal areas. Further developments in bermudagrass breeding should be monitored to speed adoption of improved, cold-hardy types.

Experimental Procedures

Tests Established in 2000

Plots were sprigged at 1-ft intervals with plants in peat pots on April 27, 2000, at the East Central Experiment Field, Ottawa, and on April 28 at the Columbus Unit of the Southeast Agricultural Research Center, except for entry CD 90160, which was seeded at 8 lb/a of pure, live seed. At the same time, another set of plots at Columbus was seeded with seed-producing cultivars that were also included in the sprigged trial. All plots were 10 x 20 ft each, arranged in four randomized complete blocks. Sprigged plots were subsequently sprayed with 1.4 lb/a of S-metolachlor. Plot coverage by bermudagrass was assessed periodically at both locations. Peat pots containing CD 90160 plants were added to plots and watered on July 3, 2002.

In 2003, 1 lb/a of hexazinone (Velpar®) was applied to the Columbus plots in March, and 0.6 lb of 2,4-D was applied at Ottawa in May. Application was made of 120-70-90 lb/a of N-P_2O_5-K_2O at Columbus in April, 2003, and 100 lb/a of N at Ottawa in May. In July, 85 lb/a of N was applied at each location.

Strips (20 x 3 ft) were cut for yield determination on June 28, July 25, and October

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22, 2003, at Columbus and on July 16 and October 16 at Ottawa. Subsamples were collected for determination of moisture.

Test Established in 2002

Five bermudagrass entries were seeded at 8 lb/acre of pure, live seed for hulled seed or 5 lb/acre of hulless seed at the Mound Valley Unit of the Southeast Agricultural Research Center on May 7, 2002. After 5.5 inches of rain on May 8 and 9 caused some washing of plots, they were harrowed lightly and reseeded on May 22. Plots were sprayed with 2,4-D on June 7 and assessed for maturity and coverage. Plots were harvested on July 22 and again on September 5. In 2003, plots were harvested on June 4, July 11, and August 7. Subsamples were collected from the 20 x 3 ft strips taken for yield to determine moisture content of forage.

Results and Discussion

Ottawa 2000 Test

Conditions in the summer of 2003 were difficult because of extreme drought. In late summer, Ottawa began to receive some moisture that enabled growth for a late-fall cutting after dormancy.

Plot coverage in the spring of 2003 was better (P<0.05) for Greenfield, Midland 99, and Wrangler than for CD 90160, Midland, and LCB84x16-66 (Table 1). After the dry summer of 2003, Midland 99, LCB84x19-16, and Greenfield had the most complete coverage. Poorest coverage was shown by CD 90160, Midland, and Wrangler.

Maturity, in terms of seedhead production, indicates poor forage quality (Table 1). In fall 2003, Greenfield, Midland 99, and Ozark were less mature than four of the other cultivars, whereas Wrangler, Midland and CD 90160 were more mature than the others.

Forage yields of the first cutting in 2003 were greater (P<.05) for the experimental lines, LCB 84x19-16 and LCB84x16-66 and for Ozark than for Midland and Wrangler (Table 1). Second-cut yields were greater for LCB 84x19-16, Ozark, Midland 99, and LCB 84x16-66, than for any of the other entries. Wrangler, Greenfield, and Guymon produced less than the other entries. Total 2003 forage yield was greater (P<.05) for LCB 84x19-16, Ozark, LCB84x16-66, and Midland 99 than for any of the other entries (Table 1)

Total forage production for the three years after establishment was greater (P<0.05) for LCB84x19-16 than for all other entries. Forage yields for Ozark, LCB84 x16-66, and Midland 99 were more than the other cultivars, while Midland produced less than all other entries and CD 90160 did not produce harvestable forage.

Columbus 2000 Test

In Columbus, plot coverage of the sprigged plots in early summer, 2003 was most complete for Guymon, which had significantly more coverage than any of four other cultivars (Table 2). The least coverage was made by CD 90160 in spite of the addition of plugs in 2002, and was significantly less than any of the top four cultivars. By late summer, 2003 in Columbus, sprigged plots of Greenfield had better cover than two of the other eight cultivars. Conversely, LCB84x16-66 and CD 90160 had poorer coverage than any of the top four cultivars (Table 2).

Maturity of sprigged plots as indicated by seedhead production, in fall 2003, was less (P>0.05) for Midland 99 than for five other cultivars (Table 2). Ozark and Greenfield were less mature than four of the other cultivars, whereas CD 90160 was more mature than all others.

Forage yields of the first cutting in Columbus were greater (P<0.05) for Guymon than any of five other cultivars (Table 2). Entries CD 90160 and LCB84x16-66 yielded less than any of the top four cultivars. Second-cut yields were greater for Midland 99, Ozark, and LCB84x19-16 than for any of the other six entries. Third-cut yields were greater for Midland 99, LCB84x16-66, Ozark, and LCB84x19-16 than for any of four other entries (Table 2).

Total forage yields of sprigged plots in 2003 were greater (P<0.05) for Midland 99 than for any other cultivar (Table 3). In turn, Ozark and LCB84x16-19 produced more total forage than any other cultivar, except for LCB84x16-66. Three-year total yields were greater for Midland 99, Ozark and LCB84x19-16 than for any other entry (Table 3).

Seeded plot coverage at Columbus was greater (P<0.05) for Guymon and Wrangler than for CD 90160 both in early and late summer (Table 4). First-cut forage yields of seeded plots in 2003 followed the same trend as coverage, with CD 90160 yielding less than either of the other cultivars. By the second cut, however, yields were similar for the three cultivars, and third-cut yield of CD 90160 was greater than yields of Wrangler and Guymon (Table 4).

Maturity, as indicated by seedhead production, in fall 2003, was less (P>0.05) for Guymon than for either of the other cultivars (Table 4). Wrangler was, in turn, less mature than CD 90160.

Total 2003 forage production of plots seeded at Columbus in 2000 was greater for Wrangler than for CD 90160, with the production of Guymon intermediate (Table 5). Forage yields totaled over a three-year period were similar, but forage of CD 90160 contained more weedy forage.

Mound Valley 2002 Test

The seeded plots at Mound Valley were fully covered by June, 2003. Forage production by June 4 was greater (P<0.05, Table 6) for Guymon than for 'Cherokee' or 'Cheyenne'. Cheyenne and Cherokee had greater production than Guymon, Wrangler, or 'Johnston's Gold' in the second cutting. There was no significant (P>0.10) difference among cultivars for third-cut yields, but total 2003 production was greater for Cheyenne than any of the other cultivars (Table 6).

Table 1. Plot Coverage, Maturity, and Forage Yield in 2003 of Bermudagrass Sprigged in 2000, Ottawa Experiment Field, Department of Agronomy.

Entry	Plot Cover†		Maturity‡	Forage Yield			
	July	Oct.	Oct.	25 July	16 Oct.	Total	3-Year Total
				- tons per acre @ 12% moisture -			
CD 90160	0.2	0.8	3.9	- -	- -	- -	- -
Greenfield	4.5	4.0	1.0	3.33	1.26	4.59	11.70
Guymon	3.8	3.5	2.2	3.16	1.50	4.67	12.18
LCB 84x16-66	2.8	3.8	2.2	3.61	3.50	7.11	16.48
LCB 84x19-16	3.8	4.2	2.5	4.10	3.72	7.81	19.16
Midland	1.5	2.0	3.8	1.36	2.02	3.38	8.72
Midland 99	4.2	5.0	1.2	3.39	3.57	6.96	16.08
Wrangler	4.0	3.0	4.0	3.02	1.17	4.19	11.58
Ozark	3.0	3.5	1.5	3.89	3.70	7.60	16.88
Average	3.1	3.3	2.5	3.23	2.52	5.76	14.01
LSD 0.05	0.8	0.9	0.9	0.57	0.37	0.78	1.59

† Ratings from 0 to 5, where 5=100% coverage.
‡Ratings from 0 to 5, where 5=100% headed.

Table 2. Plot Coverage, Maturity, and Forage Yield in 2003 of Bermudagrass Sprigged in 2000, Columbus Unit, Southeast Agricultural Research Center.

	Plot Cover†		Maturity‡	2003 Forage Yield		
Entry	June 28	July 25	July 25	June 28	July 25	Oct. 22
				- tons per acre @ 12% moisture -		
CD 90160	1.5	2.8	4.8	1.72	0.74	2.99
Greenfield	3.0	4.0	1.2	3.14	0.72	1.49
Guymon	4.2	4.0	2.0	3.67	0.52	1.53
LCB 84x16-66	1.8	2.5	2.5	1.95	0.84	3.44
LCB 84x19-16	3.2	4.0	3.0	2.48	1.46	3.19
Midland	1.8	3.5	3.0	2.34	0.89	2.50
Midland 99	3.2	4.0	1.0	3.21	1.98	3.58
Wrangler	3.2	3.5	2.8	3.27	0.35	1.85
Ozark	1.8	3.2	1.2	2.44	1.67	3.28
Average	2.6	3.5	2.4	2.69	1.02	2.65
LSD 0.05	1.5	1.1	1.2	1.00	0.50	0.54

†Ratings from 0 to 5, where 5=100% coverage.
‡Ratings from 0 to 5, where 5=100% headed.

Table 3. Forage Yield Across Years of Bermudagrass Sprigged in 2000, Columbus Unit, Southeast Agricultural Research Center.

Entry	Forage Yield 2001	2002	2003	3-Yr Total
	- - - - - - - - - - tons per acre @ 12% moisture - - - - - - - - - -			
CD 90160	- -†	- -†	5.45	- -
Greenfield	4.69	7.03	5.36	17.08
Guymon	4.92	5.78	5.72	16.42
LCB 84x16-66	3.75	7.98	6.24	17.97
LCB 84x19-16	4.87	8.75	7.13	20.76
Midland	4.12	7.11	5.74	16.97
Midland 99	5.84	8.78	8.78	23.40
Wrangler	5.34	5.85	5.47	16.65
Ozark	6.45	9.04	7.40	22.89
Average	5.00	7.20	6.36	19.02
LSD 0.05	1.04	1.16	1.18	2.25

†Contained other grasses.

Table 4. Plot Coverage, Maturity, and Forage Yield in 2003 of Bermudagrass Seeded in 2000, Columbus Unit, Southeast Agricultural Research Center.

	Plot Cover†		Maturity‡	2003 Forage Yield		
Entry	June 28	July 25	July 25	June 28	July 25	Oct. 22
				- tons per acre @ 12% moisture -		
CD 90160	1.8	3.0	4.8	1.07	0.73	3.06
Guymon	4.2	4.5	2.2	3.03	0.54	1.65
Wrangler	4.0	5.0	3.0	3.54	0.62	1.61
Average	3.3	4.2	3.3	2.54	0.63	2.11
LSD 0.05	1.2	1.0	0.6	0.49	NS	0.67

†Ratings from 0 to 5, where 5=100% coverage.
‡Ratings from 0 to 5, where 5=100% headed.

Table 5. Forage Yield Across Years of Bermudagrass Seeded in 2000, Columbus Unit, Southeast Agricultural Research Center.

	Forage Yield			
Entry	2001	2002	2003	3-Yr Total
	- - - - - - - - - - tons per acre @ 12% moisture - - - - - - - - - -			
CD 90160	3.51†	4.78†	4.86	13.14
Guymon	3.62	5.66	5.22	14.51
Wrangler	3.38	5.37	5.77	14.52
Average	3.50	5.27	5.28	14.06
LSD 0.05	NS	0.67	0.86	NS

†Contained other grasses.

Table 6. Forage Yield of Bermudagrass Seeded in 2002, Mound Valley Unit, Southeast Agricultural Research Center.

	2003 Forage Yield			
Entry	June 4	July 11	Aug. 7	Total
	- - - - - - tons per acre @ 12% moisture - - - - - -			
Cherokee	0.82	1.47	0.47	2.76
Guymon	1.60	0.66	0.47	2.73
Wrangler	1.30	0.68	0.49	2.47
Johnston's Gold	1.33	0.88	0.54	2.75
Cheyenne	1.11	1.57	0.60	3.29
Average	1.23	1.05	0.52	2.80
LSD 0.05	0.41	0.29	NS	0.50

PERFORMANCE OF WARM-SEASON PERENNIAL FORAGE GRASSES

Joseph L. Moyer and Kenneth W. Kelley

Summary

Twelve warm-season perennial grasses seeded in spring, 2001, were harvested for forage production on July 17, 2003. Production averaged 1.09 tons/a. Two indiangrass entries produced more ($P<0.05$) forage than did other species.

Introduction

Warm-season, perennial grasses can fill a production void left in forage systems by cool-season grasses. Reseeding improved varieties of certain native species, such as big bluestem and indiangrass, could help fill that summer production "gap." Other warm-season grasses, such as sand bluestem (*Andropogon hallii* Hack.), are used in other areas, and may have potential for certain sites in southeastern Kansas.

Experimental Procedures

Warm-season grass plots (30 ft x 5 ft) were seeded with a cone planter in 10-inch rows on May 10, 2001 at the Columbus 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 and sand bluestem entries were seeded at 10 lb pure, live seed (PLS)/a. Indiangrasses were seeded at 8 lb PLS/a. Entries were obtained from the USDA-NRCS Plant Materials Center in Manhattan, the USDA-ARS Southern Plains Research Station, Woodward, Okla., and the USDA-ARS Forage Research Unit, Lincoln, Neb. Plots were sprayed with 2,4-D to control weeds in 2001. In 2002, plots were burned in spring and clipped in summer. A 20 ft x 3 ft area was harvested on July 17, 2003, with a Carter flail harvester at a height of 2-3 inches, and the remainder of the area was clipped to the same height.

Results and Discussion

Forage yields from the warm-season cultivar test are shown in Table 1. Stands were generally good, except for TS Early big bluestem. As a result, forage harvested from TS Early big bluestem plots contained some forage from weedy grass species. Forage production in 2003 averaged 1.09 tons/a (Table 1). ‘Osage’ and NE 54 C2 indiangrasses produced more than any other entry except Holt x Oto Late C3 indiangrass. The two experimental sand bluestems produced less than any of the four indiangrass entries, and less than three of the five big bluestem entries.

Table 1. Forage Yields of Warm-Season Grass Cultivars, Parsons Unit, Southeast Agricultural Research Center, 2003.

Species	Cultivar	Forage Yield
		- tons/a @ 12% moisture -
Big bluestem	Kaw	1.18
	Pawnee C3 Syn. 2	1.20
	Kaw C3 Syn. 2	1.20
	TS Intermediate	0.94
	TS Early	0.30[1]
Sand bluestem	WW (Woodward)	0.98
	AB Medium	0.76
	CD Tall	0.80
Indiangrass	Oto C3 Syn. 2	1.14
	Holt x Oto Late C3 Syn. 2	1.26
	NE 54 C2	1.56
	Osage	1.52
LSD(0.05)		0.33

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

EFFECTS OF POPULATION, PLANTING DATE, AND TIMING OF LIMITED-AMOUNT IRRIGATION ON SWEET CORN

Daniel W. Sweeney and M.B. Kirkham[1]

Summary

In 2003, irrigation increased the number of harvestable ears, total fresh weight, and individual ear weight of sweet corn. Early planting increased total ears, but fresh weight and individual ear weight were unaffected. Increasing plant population to more than 15,000 plants/a reduced ear weight.

Introduction

Field corn responds to irrigation, and timing of water deficits can affect yield components. Sweet corn is considered as a possible value-added, alternative crop for producers. 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. Information is lacking on effects of irrigation management, plant population, and planting date on the performance of sweet corn.

Experimental Procedures

The experiment was established on a Parsons silt loam in spring 2002 as a split-plot arrangement of a randomized complete block with three replications. The whole plots included four irrigation schemes: 1) no irrigation, 2) 1.5 in. at VT (tassel), 3) 1.5 in. at R2 (blister), 4) 1.5 in. at both VT and R2; and two planting dates (targets of late April and mid-May). The subplots were three plant populations of 15,000; 22,500; and 30,000 plants/a. Sweet corn was planted on April 22 and May 27, 2003. Sweet corn from the first planting date was picked on July 24 and 28, and corn from the second planting date was picked on Aug. 1 and 4, 2003.

Results and Discussion

The total number of ears was 6% less from the May-planted sweet corn than from sweet corn planted in late April (Table 1), but there were no differences in total fresh weight or individual ear weight. Limited irrigation resulted in as much as 30% more ears and 47% greater fresh weight than no irrigation. Irrigation at VT (tassel) resulted in more ears than irrigation at R2 (blister), but irrigating at both VT and R2 resulted in the greatest number of ears. Total fresh weight was greatest with irrigations at both VT and R2. Both the total number of ears and fresh weight were affected by a planting date by irrigation scheme interaction because delaying the supplemental irrigation to R2 for sweet corn planted in May resulted in values similar to sweet corn receiving no irrigation. Increasing plant population did not result in a significant increase in harvested ears. But there was a reduction in individual ear weight that also resulted in lower total fresh weight from increased populations compared with the lowest population density.

[1] Department of Agronomy, KSU.

Table 1. Effects of Planting Date, Irrigation Scheme, and Plant Population on Sweet Corn, Southeast Agricultural Research Center, 2003.

Treatment	Total Ears	Total Fresh Weight	Individual Ear Weight
	ears/a	ton/a	g/ear
Planting Date (D)			
Date 1	17500	4.48	233
Date 2	16400	4.28	235
LSD (0.05)	1000	NS	NS
Irrigation Scheme (I)			
None	14700	3.55	220
VT (1.5 in.)	17700	4.55	235
R2 (1.5 in.)	16300	4.21	234
VT-R2 (1.5 in. at each)	19200	5.21	247
LSD (0.05)	1400	0.44	14
Population (P), plants/a			
15000	16700	4.63	251
22500	16500	4.32	237
30000	17700	4.19	214
LSD (0.05)	NS	0.31	10
Interactions	D×I	D×I	NS

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

Daniel W. Sweeney

Summary

During a 20-year grain sorghum-soybean rotation, grain sorghum yields were generally greater with conventional or reduced tillage than with no tillage and with N fertilization, especially as anhydrous NH_3. In contrast, during the 20 years, soybean yield was unaffected by tillage or residual N. At the end of the 20-year study, tillage options resulted in distribution differences of soil organic matter content in the top six inches, but no overall difference in concentration. Soil bulk density at the end of 20 years was unaffected by tillage or N fertilization choices.

Introduction

Many 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 system as the whole plot and N treatment as the subplot. 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 2001 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. Effects of residual N were measured for soybean, even though N fertilizer was applied only to grain sorghum. Soil samples were collected at the end of the 20-year study and were analyzed for bulk density and organic matter content.

Results and Discussion

Analyzed across all grain sorghum years (odd-numbered years) from 1983 to 2001, yield was affected by tillage and nitrogen fertilization (Figure 1). Without N fertilizer, grain sorghum averaged approximately 40 bu/a in conventional and reduced tillage systems and around 30 bu/a in no-tillage. Anhydrous NH_3 application generally increased yields more than the other nitrogen fertilizers, except for broadcast urea in the reduced tillage system. Although anhydrous NH_3 application improved yields in no-till, yields were still less than with anhydrous NH_3 applications in the other tillage systems. Statistically, grain sorghum yields were only less with no-tillage in 5 of the 10 grain sorghum years (individual year data not shown). In those years, however, grain sorghum yield averaged 21 and 25 bu/a less with no-tillage than with reduced or conventional tillage, respectively. In contrast, analyzed across all soybean years (even-numbered years) from 1984 to 2002, soybean yield averaged 22.2 bu/a and was unaffected by tillage system or N residual (data not shown) even though growing conditions varied widely during this time, with soybean yields ranging from near 5 bu/a to more than 40 bu/a.

Long-term continuous use of different tillage systems and N fertilization schemes has the potential to affect soil quality. Two of the measures of soil quality are organic-matter content and bulk density. Soil organic-matter content in the 0- to 3-inch zone was less with conventional tillage than with either reduced or no-tillage (Table 1). In the 3-6 inch zone, however, organic-matter content was less with no tillage than with conventional or reduced tillage. As a result, when composited across the 0- to 6-inch zone, which is the typical soil sampling depth, organic matter was not statistically affected by tillage. These data show that the distribution of organic matter may change in the top 6-inch soil zone, but that the overall concentration is not affected by tillage. Organic matter content in the 6- to 12-inch zone was also not affected by tillage. Nitrogen fertilization schemes also did not affect organic-matter content at any soil depth. Bulk density was not affected after twenty years by tillage system or N fertilization scheme at any soil depth (Table 2). In this claypan soil, soil quality, as indicated by organic-matter content and bulk density, was not greatly affected by twenty years of different tillage systems or N fertilization schemes.

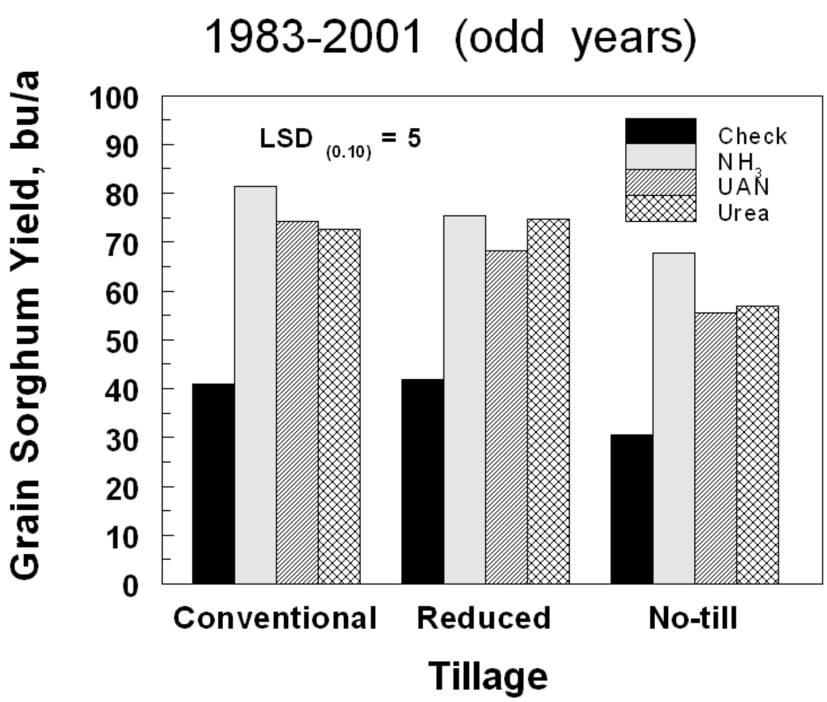

Figure 1. Effects of Tillage System and N Fertilization Scheme on Grain Sorghum Yield in Odd-Numbered Years from 1983 to 2001, Southeast Agricultural Research Center.

Table 1. Soil Organic Matter Content after Twenty Years of a Grain Sorghum-Soybean Rotation, Southeast Agricultural Research Center, 2002.

	Organic Matter			
Treatment	0-3"	3-6"	0-6"	6-12"
	-------------------%	-------------------		
Conventional	2.30	1.82	2.09	1.35
Reduced	2.60	1.86	2.25	1.26
No-till	2.76	1.31	2.05	1.23
LSD (0.05)	0.30	0.41	NS	NS
Check (No N)	2.49	1.57	2.05	1.21
Anhydrous NH_3	2.52	1.63	2.08	1.23
UAN broadcast	2.68	1.73	2.23	1.40
Urea broadcast	2.53	1.72	2.15	1.28
LSD (0.05)	NS	NS	NS	NS

Table 2. Soil Bulk Density after Twenty Years of a Grain Sorghum-Soybean Rotation, Southeast Agricultural Research Center, 2002.

	Bulk Density			
Treatment	0-3"	3-6"	0-6"	6-12"
	------------------- g/cm^3 -------------------			
Conventional	1.21	1.59	1.41	1.48
Reduced	1.19	1.56	1.37	1.46
No-till	1.24	1.63	1.44	1.42
LSD (0.05)	NS	NS	NS	NS
Check (No N)	2.49	1.57	2.05	1.21
Anhydrous NH_3	2.52	1.63	2.08	1.23
UAN broadcast	2.68	1.73	2.23	1.40
Urea broadcast	2.53	1.72	2.15	1.28
LSD (0.05)	NS	NS	NS	NS

EFFECTS OF RESIDUAL SOIL PHOSPHORUS AND POTASSIUM FOR GLYPHOSATE-TOLERANT SOYBEAN PLANTED NO-TILL

Daniel W. Sweeney

Summary

In 2003, increasing antecedent soil K test levels produced greater soybean yield, whereas different soil P test levels did not increase yield.

Introduction

The response of soybean to phosphorus (P) and potassium (K) fertilization can be sporadic, and producers often omit these fertilizers. As a result, soil test values can decline. Acreage planted with no tillage may increase because of new management options such as glyphosate-tolerant soybean cultivars. But, data are lacking regarding the importance of soil P and K concentrations on yield of glyphosate-tolerant soybean grown with no tillage.

Experimental Procedures

The experiment was established on a Parsons silt loam in spring 1999. Since 1983, fertilizer applications have been maintained to develop a range of soil P and K concentrations. The experimental design is a factorial arrangement of a randomized complete block with three replications. The three residual soil P amounts averaged 5, 11, and 28 ppm, and the three soil K amounts averaged 52, 85, and 157 ppm at the conclusion of the previous experiment. Each year, Roundup Ready® soybean was planted during late May to mid June with no tillage.

Results and Discussion

Environmental conditions in 2003 resulted in soybean yields averaging about 20 bu/a (Table 1). Soil P concentrations had no effect on soybean yields. But an increased number of pods per plant with the greatest soil test P may suggest a potential for increased yield under better growing conditions. Greater soil K amounts increased glyphosate-tolerant soybean yield by as much as 21% compared with plots that have never received K fertilizer. This yield increase may have been related to changes in pods per plant and seeds per pod. Yield was affected by a P x K interaction in which an increase in soil K resulted in a yield increase in the absence of P fertilization or with greater amounts of P fertilization, but not in soil that had received lesser amounts of P fertilization.

Table 1. Effects of Antecedent Soil P and K Test Levels on Glyphosate-tolerant Soybean Yield and Yield Components, Southeast Agricultural Research Center, 2003.

Initial Soil Test Level	Yield	Population	Seed Weight	Pods/plant	Seeds/pod
	bu/a	plants/a	mg		
P (ppm)					
5	20.6	89 000	119	29	1.5
11	21.1	81 700	113	34	1.5
28	20.8	85 700	111	37	1.4
LSD (0.05)	NS	NS	NS	5	NS
K (ppm)					
52	18.5	85 800	110	30	1.4
85	21.4	82 300	119	37	1.4
157	22.5	88 200	113	32	1.6
LSD (0.10)	2.9	NS	NS	4	0.1
PxK Interaction	NS	NS	NS	NS	NS

USE OF STRIP-TILLAGE FOR CORN PRODUCTION IN A CLAYPAN SOIL

Daniel W. Sweeney, Ray Lamond[1], and Gary Kilgore[2]

Summary

Tillage selection did not significantly affect short-season corn yields in 2003. Early spring fertilization with N and P solutions resulted in greater yield than N-P fertilizer application in late fall.

Introduction

The use of conservation tillage systems is promoted to reduce the potential for sediment and nutrient losses. In the claypan soils of southeastern Kansas, crops grown with no tillage may yield less than in systems involving some tillage operation. But strip tillage provides a tilled seed-bed zone where early spring soil temperatures might be greater while leaving residues intact between the rows as a conservation measure similar to no-tillage.

Experimental Procedures

The experiment was established on a Parsons silt loam in late fall 2002. The experimental design was a split-plot arrangement of a randomized complete block with three replications. The four tillage systems constituting the whole plots were: 1) strip tillage in late fall, 2) strip tillage in early spring, 3) reduced tillage (1 pass with tandem disk in late fall and 1 pass in early spring), and 4) no tillage. The subplots were a 2×2 factorial arrangement of fertilizer timing and fertilizer placement. Fertilizer application timing was targeted for late fall or early spring. Fertilizer placement was dribble [surface band] or knife [subsurface band at 4 in-depth]. Fertilizer rates of 120 lb N/a and 40 lb P_2O_5/a were applied in each fluid fertilizer scheme. Fertilization was done on Dec. 17, 2002, and on April 1, 2003. Short-season corn was planted on April 3, 2003, and harvested on Aug. 25, 2003.

Results and Discussion

Strip tillage done either in late fall or early spring in 2003 resulted in short-season corn yields of 115 bu/a, not significantly different than yield with no tillage (114 bu/a) or reduced tillage (108 bu/a). Fertilization done in early spring 2003 resulted in average corn yields of 121 bu/a, significantly more than yield with late fall fertilization (105 bu/a). Knife (subsurface band) applications did not result in statistically greater yield than dribble (surface band) applications (115 vs. 111 bu/a).

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INTEGRATED AGRICULTURAL MANAGEMENT SYSTEMS: NEOSHO RIVER BASIN SITE[1]

Daniel W. Sweeney, Gary M. Pierzynski[1], Meghan Buckley[2], and Gary L. Kilgore[3]

Summary

Total losses of sediment, nutrients, and pesticides have been variable during 2001 to 2003. Regardless, measured values seem small.

Introduction

The quality of our water resources is an important topic. Agricultural practices are perceived to impact surface water quality by being a non-point source of pollutants. Producers need to use voluntary practices, such as Best Management Practices (BMPs), to protect and improve surface water quality in the state. Recent state-wide efforts in Kansas are designed to look at large, field-scale integrations of BMPs to determine their effects on losses of sediment, nutrients, and pesticides into surface waters.

Experimental Procedures

The experiment was established on a Parsons silt loam in spring 1999 at the Greenbush Facility in Crawford County, but was not fully implemented until 2000. The four treatments were: 1) Conventional tillage (spring chisel, disk, field cultivate, plant); Low management: nitrogen (N) and phosphorus (P) broadcast, with incorporation by tillage; and atrazine and metolachlor herbicides applied preemergence, 2) Conventional tillage; High management: N and P knifed in, followed by tillage; metolachlor applied preemergence and atrazine applied postemergence, 3) No tillage; Low management: N and P broadcast; atrazine and metolachlor applied preemergence, and 4) No tillage; High management: N and P knifed in; metolachlor applied preemergence and atrazine applied postemergence. For grain sorghum, the total N rate was 120 lb/a and P was 40 lb P_2O_5/a. The background crop in 1999 was soybean. Grain sorghum was planted in 2000, 2001, and 2003, and soybean was planted in 2002.

At the downslope end of each 1-acre plot, a soil berm was constructed to divert surface water flow through a weir. In March 2001, soil berms were planted with fescue grass and covered with erosion matting material to minimize the potential for berm erosion to affect sediment values from runoff samples, as it seemed in 2000. Each weir was equipped with an ISCO® sampler that recorded flow amounts and collected runoff samples. Water samples were analyzed at the Soil Testing Laboratory for sediment, nutrients, and selected herbicides.

Results and Discussion

Runoff and loading rates during 2001 to 2003

[1] This research has been partly funded by the Kansas Fertilizer Research Fund; the Kansas Corn, Sorghum, Soybean, and Wheat Commissions; and the USDA Integrated Research, Education, and Extension Water Quality Program.

[2] Department of Agronomy, KSU.

[3] KSU Southeast Area Extension Office, Chanute.

have been variable (Table 1). No tillage with high management (NTH) often resulted in greater runoff and total losses of potential pollutants, although the differences are not always significant. Regardless, measured sediment, nutrient, and pesticide loadings (Table 1) and concentrations (Table 2) from all treatments generally seem small.

Table 1. Seasonal Runoff Volume and Total Losses of Sediment, Total N, Ammonium, Nitrate, Total P, Bioavailable P (BAP), Soluble P, Atrazine, and Metolachlor at Crawford County in 2001 through 2003.

Treatment	Runoff	Sediment	Total-N	Ammonium	Nitrate	Total-P	BAP	Soluble-P	Atrazine	Metolachlor
	ac-in	-----------	-----------	-----------	lb/a	-----------	-----------	-----------	----g/a----	
					2001: Sorghum					
CHL†	3.7c‡	803a	3.8b	0.2a	1.3c	0.8b	0.4b	0.4a	3.0a	3.1a
CHH	5.2b	410a	4.0b	0.3a	1.8b	1.1b	0.6ab	0.8a	7.9a	4.4a
NTL	3.0c	205a	2.9c	0.2a	1.6bc	0.7b	0.5b	0.5a	13.4a	10.7a
NTH	8.0a	785a	9.1a	0.5a	5.1a	1.7a	1.0a	1.0a	7.4a	12.3a
					2002: Soybeans					
CHL	9.1b	78a	4.6b	0.7b	0.8b	6.2a	1.1a	1.0a	0.4a	12.3a
CHH	12.6b	89a	6.3b	1.0a	0.6b	7.5a	1.5a	1.4a	0.2a	11.5a
NTL	10.4b	89a	6.9b	0.7b	0.9b	13.9a	2.1a	1.9a	0.2a	40.8a
NTH	18.4a	178a	11.4a	1.0a	2.2a	10.0a	2.4a	2.1a	0.3a	19.0a
					2003: Sorghum					
CHL	4.1a	214a	5.8a	0.5b	3.6a	0.8a	0.5a	0.5a	2.1a	1.3b
CHH	3.0a	89a	13.8a	3.9a	5.3a	2.9a	1.3a	2.8a	0.9a	0.9b
NTL	2.0a	428a	8.8a	5.7a	3.0a	2.9a	2.5a	2.5a	2.3a	1.5ab
NTH	3.3a	89a	5.7a	1.2b	2.1a	0.9a	0.6a	0.6a	2.7a	2.5a

† CHL = conventional tillage with low management, CHH = conventional tillage with high management, NTL = no tillage with low management,

NTH = no tillage with high management.

‡ Values with same letter are not significantly different at P = 0.20.

Table 2. Volume-Corrected Season Total Concentrations of Sediment, Total N, Ammonium, Nitrate, Total P, Bioavailable P (BAP), Soluble P, Atrazine, and Metolachlor lost at Crawford County in 2001 through 2003.

Treatment	Sediment	Total-N	Ammonium	Nitrate	Total-P	BAP	Soluble-P	Atrazine	Metolachlor
	---------- ppm				----------		---------- ppb		----------
				2001: Sorghum					
CHL†	660a‡	3.9a	0.3a	1.2a	0.9a	0.5a	500a	5.4a	5.9a
CHH	330a	3.5a	0.2a	1.6a	1.0a	0.6a	710a	10a	8.6a
NTL	350a	4.9a	0.3a	2.8a	1.1a	0.6a	820a	45a	28.0a
NTH	430a	5.1a	0.3a	2.8a	1.0a	0.5a	570a	6.3a	15.0a
				2002: Soybeans					
CHL	38a	2.0c	0.3a	0.4ab	0.6b	0.5b	460a	0.7a	14.0a
CHH	34a	2.3bc	0.3a	0.2c	0.6b	0.5b	500a	0.1a	11.0a
NTL	40a	2.7a	0.3a	0.3bc	0.9a	0.9a	750a	0.1a	36.0a
NTH	37a	2.6ab	0.2a	0.5a	0.6b	0.6b	490a	0.2a	9.3a
				2003: Sorghum					
CHL	290b	6.6a	0.6b	3.9a	0.9b	0.6a	570a	3.9a	2.9a
CHH	110b	14.0a	5.0b	7.0a	4.0ab	3.7a	3740a	2.9a	2.5a
NTL	930a	26.0a	12.0a	6.9a	6.4a	5.5a	5430a	8.7a	5.5a
NTH	110b	7.4a	0.8b	4.0a	1.1b	0.8a	800a	9.7a	13.0a

† CHL = conventional tillage with low management, CHH = conventional tillage with high management, NTL = no tillage with low management, NTH = no tillage with high management.

‡ Values with same letter are not significantly different at P = 0.20.

EFFECTS OF PREVIOUS CROP, FERTILIZER PLACEMENT METHOD, AND NITROGEN RATE ON WINTER WHEAT GRAIN YIELD WHEN PLANTED NO-TILL

Kenneth W. Kelley and Daniel W. Sweeney

Summary

Wheat yields were influenced significantly by previous crop, fertilizer nitrogen (N) and phosphorus (P) placement method, and N rate. Grain yields averaged 65 bu/a following corn, 60 bu/a following soybean, and 54 bu/a following grain sorghum. Applying fertilizer N (28% UAN) and P (10 - 34 - 0) below crop residues with a coulter-knife applicator also significantly increased grain yield compared with surface strip band and broadcast fertilizer treatments, regardless of previous crop. In addition, grain yields increased with increasing N rate, except for wheat following soybean.

Introduction

In southeastern Kansas, wheat often is planted after a summer crop as a means of crop rotation; but previous crop, as well as the amount of plant residues remaining after harvest, affects fertilizer N efficiency. Placement of both N and P fertilizers also becomes an important factor, especially for wheat planted no-till into previous crop residues. When fertilizer N, such as urea or liquid urea ammonium nitrate solution, is surface-applied, there is potential for greater N loss through volatilization and immobilization, particularly when amounts of residues are large. This research seeks to evaluate how the previous crop (corn, grain sorghum, or soybean) affects the utilization of applied N and P fertilizer by winter wheat when planted no-till. Various N rates also were evaluated.

Experimental Procedures

The experiment was a split-plot design, in which the main plots were previous crop (corn, grain sorghum, and soybean) and subplots included a factorial arrangement of four N rates (20, 40, 80, and 120 lbs N/a) with three N-P application methods: 1) liquid N and P knifed on 15-in. centers at a depth of 4 to 6 in., 2) liquid N and P surface-applied in 15-in. strip bands, and 3) liquid N and P broadcast on soil surface. Phosphorus (P) was applied at a constant rate of 68 lbs P_20_5/a, except for the control plot. Nitrogen source was liquid 28% N, and P source was liquid 10-34-0. All N-P fertilizer treatments were fall-applied before planting. All plots also received 120 lbs K_20/a as a preplant broadcast application. Seeding rate was 100 lbs/a.

Soil samples taken in the fall after harvest and before wheat fertilization showed that residual nitrate-N concentrations in the top 12 in. of soil averaged 38 lb N/a following corn, 34 lb N/a following soybean, and 21 lb N/a following grain sorghum. Soil organic matter averaged 2.7% (0 to 6 in.), and soil P concentration was 46 lb P/a in the top 6 in.

Results and Discussion

Wheat yields were influenced significantly by previous crop, N-P application method, and N rate (Table 1). Grain yields averaged 65 bu/a following short-season corn, 60 bu/a following soybean, and 54 bu/a following grain sorghum. Averaged over previous crops and N rates, grain yields were greatest with knifed N-P applications, intermediate for surface strip banding, and least for surface broadcast treatments. Grain yields also increased with increasing N rates, except where N was applied below crop residues with the coulter-knife applicator following soybean. With the knifed N-P application, wheat yields were reduced at the highest N rate (120 lb N/a) following soybean because of plant lodging.

Previous crop residues did not seem to affect wheat germination or early seedling growth through the process of allelopathy. Yield results suggest that N losses from leaching or denitrification were minimal at this site, where soil slope prevented ponding of surface water. Wheat yield differences between previous crops and N-P placement methods seem to be primarily related to greater availability of both fertilizer and residual soil N following corn. At the highest N rate, yield differences between crops were less pronounced compared with lower N rates.

In this study, in which initial soil test P concentrations averaged nearly 45 lb P/a, grain yields were affected more by fertilizer N management than by P placement. But research has shown that the dual placement of liquid N and P in a concentrated band application enhances P availability because of the presence of higher ammonium concentrations. Thus, P availability may be greater in knifed and strip band applications compared with surface broadcast treatments.

Results indicate that wheat yields under no-till conditions are greatly influenced by fertilizer N management practices, including both rate of application and placement method. Applying fertilizer below the soil surface results in greater fertilizer efficiency and less potential for nutrient loss from rainfall. In addition, planting wheat no-till into previous crop residues reduces soil erosion.

Table 1. Effects of Previous Crop, Nitrogen and Phosphorus Method, and N Rate on Hard Winter Wheat Grain Yield When Planted No-till, Parsons Unit, 2003.

N and P	Fertilizer Rate		Wheat Yield after		
Applic. Method	N	P_2O_5	Corn	Grain Sorghum	Soybean
	----- lbs/a -----		------------------------------ bu/a ------------------------------		
Knife	20	68	57.7	47.5	55.0
Knife	40	68	66.8	48.1	56.4
Knife	80	68	71.9	65.6	72.0
Knife	120	68	72.7	74.8	69.2
Strip Band	20	68	58.4	37.0	48.8
Strip Band	40	68	62.8	45.6	52.3
Strip Band	80	68	70.1	56.5	64.2
Strip Band	120	68	70.4	68.9	73.1
Broadcast	20	68	57.1	38.7	47.0
Broadcast	40	68	58.6	42.1	51.8
Broadcast	80	68	67.4	51.5	57.9
Broadcast	120	68	71.3	65.7	66.6
Knife Control	0	0	49.9	29.8	39.7
Control	0	0	50.5	30.1	39.8
LSD 0.05	Same PC			5.2	
	Different PC			5.3	
Means: (controls omitted)			65.4	53.5	59.5
N-P application method					
Knife			67.3	59.0	63.1
Strip Band			65.4	52.0	59.6
Broadcast			63.6	49.5	55.8
LSD 0.05			2.6	2.6	2.6
N Rate (lb/a)					
20			57.7	41.0	50.3
40			62.7	45.3	53.5
80			69.8	57.9	64.7
120			71.5	69.8	69.7
LSD 0.05			3.0	3.0	3.0

EFFECT OF PLANTING DATE ON GRAIN SORGHUM YIELD AND OTHER AGRONOMIC TRAITS

Kenneth W. Kelley

Summary

Grain sorghum yielded significantly more when planted in late April compared with planting in mid-May or early June. High air temperatures during flowering and grain-filling severely reduced yield potential of sorghum from later planting dates.

Introduction

In southeastern Kansas, grain sorghum is often planted from late April through June, depending upon weather conditions and cropping management. In recent years, more producers have opted for an earlier planting date so that flowering occurs before the hottest and driest period of late July and early August. In addition, early-planted grain sorghum matures in late August or early September when weather is typically favorable for harvesting. When soil conditions are too wet in late April or early May, however, producers may delay planting until early June so that grain sorghum will flower in late August and early September when air temperatures often are somewhat cooler. This research evaluated various grain sorghum hybrids with different maturities at three different planting dates for effects on grain yield and other agronomic traits.

Experimental Procedures

Beginning in 2000, various grain sorghum hybrids with different maturities were planted with conventional tillage (chisel - disk - field cultivate) at three different planting dates (April, May, and June) in 30-in. row spacing at a seeding rate of 45,000 seeds/a. Fertilizer was applied preplant at a rate of 120 lb N/a, 60 lb P_20_5/a, and 75 lb K_20/a. Herbicides were applied preemergence for weed control. Plots were machine harvested at different times, depending on grain sorghum maturity, and yields were adjusted to 12.5 % moisture.

Results and Discussion

Grain sorghum results for 2003 are shown in Table 1. Planting date results for the 3-yr period from 2000 to 2002 were previously reported in the 2003 Report of Progress. Grain sorghum yields were greater from the late April planting and least from the June planting. Early-planted grain sorghum generally flowered before mid-July, regardless of hybrid maturity. In all 4 years, June-planted grain sorghum yielded significantly less than April-planted sorghum because high air temperatures during August and early September were unfavorable for grain development. In addition, some hybrids were affected more by high air temperatures during flowering than others. Plant height decreased with delayed planting date.

Results confirm that April-planted grain sorghum often flowers before the onset of hot and dry conditions in mid-summer; thus, for the current weather patterns experienced in southeastern Kansas, yield potential is greater for the April planting date.

Table 1. Effect of Planting Date on Grain Sorghum Yield, Test Weight, Height, and Maturity, Columbus Unit, Southeast Agricultural Research Center, 2003.

		Yield			Test Weight			Height			Heading Date		
Brand	Hybrid	April	May	June	April	May	June	April	May	June	April	May	June
		---------- bu/a ----------			---------- lbs/bu ----------			---------- in.----------					
Asgrow	459	106.0	80.4	67.2	60.1	55.6	55.3	45	45	47	7/8	7/26	8/10
DeKalb	40-Y	103.1	72.8	75.5	60.5	56.5	56.2	43	42	44	7/10	7/24	8/7
DeKalb	54-00	115.7	59.0	77.0	59.7	54.1	54.1	48	45	46	7/12	7/28	8/13
Hoegemeyer	6712	106.7	95.1	63.7	58.7	56.2	50.4	42	41	41	7/10	7/22	8/3
NC+	7B47	114.1	80.8	73.1	59.3	55.8	54.1	41	40	43	7/12	7/24	8/8
NC+	7C22	102.6	83.4	71.8	60.1	57.0	56.3	47	42	45	7/11	7/22	8/6
NK	KS585	107.1	98.7	64.2	61.1	59.1	54.9	43	40	41	7/4	7/20	8/2
Pioneer	8500	108.4	89.2	74.6	59.3	58.1	55.7	46	44	47	7/8	7/22	8/5
Pioneer	84G62	128.6	93.7	86.6	59.2	57.7	57.3	46	42	45	7/12	7/24	8/11
Pioneer	84Y00	116.3	89.5	74.9	58.8	57.3	55.0	47	44	47	7/14	7/24	8/9
Avg.		110.9	84.3	72.9	59.7	56.8	54.9	45	43	45	7/10	7/24	8/7

LSD (0.05) for yield: date of planting means = 5.6 ; between hybrids and same planting date = 7.7; between hybrids and different date of planting or same hybrid and different date of planting = 8.5

Planting dates: April 23, May 13 and June 10.

Rainfall: April 4,5 = 1.4; 16 = 0.4; 19 = 0.8; 23 = 1.1
May 1 = 0.8; 4 = 0.65; 10 = 0.4; 13 = 1.0; 15,16 = 2.25; 20 = 0.25; 24 = 0.8
June 2 = 0.6; 6 = 0.75; 11 = 0.2; 12 = 0.25; 25 = 1.4
July 9 = 0.4; 22 = 1.5
Aug 4 = 0.5; 5 = 0.2; 27 = 0.9; 29 = 3.5; 30,31 = 4.5
Sept 1 = 0.35; 3 = 0.9; 5-6 = 8.0; 12 = 0.1; 18 = 0.8; 21 = 0.5; 30 = 0.55

EFFECTS OF CROPPING SYSTEMS ON WINTER WHEAT AND DOUBLE-CROP SOYBEAN YIELD[1]

Kenneth W. Kelley and Daniel W. Sweeney

Summary

Wheat yields were similar with different previous crops (corn, grain sorghum, and soybean) when fertilizer N and P were knifed below crop residues. Wheat yields also were affected very little by tillage method (no-till vs. disk). Previous crop before wheat significantly influenced double-crop soybean yields in nearly all years. Soybean yields were greatest when corn and grain sorghum preceded wheat and least when soybean preceded wheat.

Introduction

Winter wheat is often rotated with other crops, such as soybean, grain sorghum, and corn, to diversify cropping systems in southeastern Kansas. Wheat typically is planted with reduced tillage, although the acreage of wheat planted no-tillage has increased significantly in recent years. In extreme southeastern Kansas, double-crop soybean traditionally is planted after wheat harvest. Like wheat, more double-crop acreage is being planted with conservation tillage methods. This research investigates the combined effects of both crop rotation and tillage on yields of winter wheat and double-crop soybean in a 2-yr crop rotation.

Experimental Procedures

In 1996, a 2-yr crop rotation study consisting of corn, grain sorghum, or soybean in rotation with wheat and double-crop soybean was started at the Columbus Unit on two adjacent sites. Tillage treatments were: 1) plant all crops with conventional tillage and 2) plant all crops with no-tillage. Fertilizer N (120 lb N/a as liquid 28 % N) and P (68 lb P_20_5/a as liquid 10 - 34 - 0) were applied preplant at a depth of 4 to 6 in. with a coulter-knife applicator. Potassium fertilizer (120 lb K_20/a) was broadcast applied. In conventional tillage systems, disk tillage was performed before fertilizer application and planting. Wheat was planted with a no-till drill in 7.5-in. rows at a seeding rate of 90 to 120 lb/a, depending on date of planting. In the no-till system, weeds that emerged before planting were controlled with a preplant application of glyphosate (1 pt/a). In early spring, wheat was sprayed with a postemergence herbicide to control broadleaf weeds when needed.

After wheat harvest, double-crop soybean (MG IV) was planted by using reduced-tillage (disk twice) or no-till methods. During the first 3 years of the study, double-crop soybean was planted in 30-in. rows, but, in the last 3 three years, row spacing has been 7.5-in. Weeds were effectively controlled with herbicides.

Results and Discussion

Wheat Results (Table 1)

In this 2-yr rotation, previous crop (corn, grain sorghum, or soybean) has had a smaller effect on wheat yield, compared with previous fertilizer research trials, mainly because fertilizer N and P was knifed below crop residues in all rotations and

[1] This research was partly funded by the Kansas Soybean Commission.

tillage systems before planting. In addition, the rate of N applied (120 lb/a) has been high enough for the yields produced. Thus, wheat yield differences between previous crops were small for the 7-yr period.

Wheat yields also were affected very little by tillage method. When wheat was planted during the optimum planting window of October, grain yields were relatively good, regardless of tillage system. Results indicate that wheat planted no-till into previous summer crop residues will yield similarly to wheat planted with reduced tillage methods, provided that good management practices, such as sub-surface placement of fertilizer N and P, are used.

Double-crop Soybean Results (Table 2)

Previous crop before wheat significantly influenced double-crop soybean yields in nearly all years. Soybean yields were greatest when corn and grain sorghum preceded wheat and least when soybean preceded wheat. Nutrient analyses of double-crop soybean plants have shown very little difference in nutrient uptake between previous crops. More research is needed to determine why the observed yield response occurs.

In the initial years of the study, double-crop soybean yields were similar between reduced and no-till methods. In the last few years, however, which have been drier than normal during the growing season, double-crop soybean yields have been significantly greater when planted no-till. Initially, there was concern that soybean root growth would be reduced in no-till systems, but recent data suggest that no-till planted double-crop soybean are better able to withstand drought stress conditions. Additional research is planned to further evaluate the effects of conservation management practices on soil quality characteristics, such as quantities of soil carbon and organic matter.

Table 1. Effects of Previous Crop and Tillage on Winter Wheat Yield, Columbus Unit, Southeast Agricultural Research Center, 1997 - 2003.

Previous Crop before Wheat	Tillage	Winter Wheat Yield 1997	1998	1999	2000	2001	2002†	2003
		--- bu/a ---						
Corn	No-till	36.7	57.2	40.1	61.9	70.8	40.2	76.5
Corn	Disk	39.1	61.8	40.5	61.6	65.9	42.1	78.1
Grain sorghum	No-till	34.1	59.1	40.0	55.1	70.8	33.3	75.9
Grain sorghum	Disk	37.5	61.2	44.6	59.8	68.2	37.2	72.4
Soybean	No-till	36.4	61.6	37.5	65.0	73.7	45.2	85.5
Soybean	Disk	36.0	63.1	43.4	63.1	72.3	41.3	75.5
Means:								
Corn		37.9	59.5	40.3	61.8	68.4	41.2	77.3
Grain sorghum		35.8	60.1	42.3	57.5	69.5	35.2	74.2
Soybean		36.2	62.3	40.5	64.0	73.0	43.3	80.5
LSD (0.05)		NS	2.4	NS	3.2	NS	2.2	5.2
No-till		35.7	59.3	39.2	60.6	71.7	39.6	79.3
Disk		37.5	62.0	42.8	61.5	68.8	40.2	75.4
LSD 0.05		NS	2	NS	NS	NS	NS	NS
Planting date		12/12	10/22	11/25	10/25	10/25	10/23	10/17

† Hail damage in 2002.

Table 2. Effects of Previous Crop and Tillage on Double-Crop Soybean Yield, Columbus Unit, Southeast Agricultural Research Center, 1997 - 2003.

Previous Crop		Double-crop Soybean Yield						
before Wheat	Tillage	1997	1998	1999	2000†	2001	2002	2003‡
		----------------------------------			bu/a			----------------------------------
Corn	No-till	38.5	31.8	27.7	9.4	36.9	32.9	36.4
Corn	Disk	39.3	31.2	24.5	10.0	30.4	29.8	39.6
Grain sorghum	No-till	39.4	30.9	28.4	11.5	36.8	33.4	38.9
Grain sorghum	Disk	40.3	32.2	26.0	9.8	32.2	30.3	36.0
Soybean	No-till	33.2	26.2	26.9	9.7	31.7	28.2	30.3
Soybean	Disk	32.8	26.3	20.8	8.6	25.8	25.6	29.1
Means:								
Corn		38.9	31.5	26.1	9.7	33.7	31.3	38.0
Grain sorghum		39.9	31.6	27.2	10.7	34.5	31.8	37.4
Soybean		33.0	26.3	23.9	9.1	28.7	26.9	29.7
LSD 0.05		2.3	3.0	2.4	1.3	2.6	1.7	2.1
No-till		37.0	29.6	27.7	10.2	35.1	31.5	35.2
Disk		37.5	29.9	23.8	9.4	29.5	28.5	34.9
LSD 0.05		NS	NS	1.9	NS	2.2	1.4	NS

† 2000 yields were influenced by summer drought and early freeze damage.
‡ In 2003, all double-crop soybean was planted with no-tillage, but tillage was performed in disk plots on previous crops (wheat in fall of 2002 and summer crops in spring of 2001).

EFFECTS OF TILLAGE, ROW SPACING, AND HERBICIDE ON FULL-SEASON SOYBEAN FOLLOWING GRAIN SORGHUM[1]

Kenneth W. Kelley

Summary

Soybean yield differences between tillage systems, row spacing, and herbicide treatments were small in 2003. Over a 5-yr period, with conventional tillage, yields were greater when soybean were planted in 15-in. rows; with no-tillage, however, a narrower row spacing (7.5-in.) resulted in greater yields. A sequential application of glyphosate or a preplant residual herbicide treatment followed by glyphosate resulted in yields similar to the single glyphosate applied 3 wks after planting.

Introduction

In recent years, improved equipment and herbicide technology has prompted more interest in the no-till planting of glyphosate-resistant soybean in narrow rows. For optimum yield potential, however, adequate weed control is important. This research investigates the interactions of tillage, row spacing, and glyphosate herbicide application on full-season soybean following grain sorghum.

Experimental Procedures

Beginning in 1999, a 2-year rotation study involving soybean and grain sorghum was established at the Columbus Unit on two adjacent sites. Main plot treatments consist of a factorial combination of conventional tillage (CT) and no-tillage (NT) with three different row spacings (7.5, 15, and 30 in.). Subplot treatments for soybean consist of four glyphosate herbicide applications: 1) full rate at 3 wks after planting, 2) full rate at 3 wks and reduced rate at 5 wks after planting; 3) preplant residual herbicide (Prowl) + glyphosate at 3 wks after planting, and 4) control (glyphosate at 10 wks). Conventional tillage treatments consisted of disking, chiseling, disking, and field cultivating before planting. Soybean planting population was targeted at 225,000 seeds/a for 7.5-in. rows, 175,000 seeds/a for 15-in. rows, and 125,000 seeds/a for 30-in. rows.

Results and Discussion

Full-season soybean yield results for 2003 are shown in Table 1. In 2003, soybean yields were not significantly affected by tillage method, and yield differences between row spacing also were small. Weed competition was light, which resulted in only small yield differences between herbicide treatments, except for the control (glyphosate 10 wks after planting).

A 5-yr summary of soybean yields is shown in Table 2. In general, with conventional tillage, yields were greater when soybean were planted in 15-in. row spacing; with no-tillage, however, yields were slightly better with 7.5-in. row spacing. On average, soybean yields were similar for CT and NT. In addition, with only light to moderate weed competition in most years, one application of glyphosate 3 wks after planting provided adequate weed control.

[1] This research was partly funded by the Kansas Soybean Commission.

Table 1. Effects of Tillage, Row Spacing, and Herbicide on Full-Season Soybean Yield Following Grain Sorghum, Columbus Unit, Southeast Agricultural Research Center, 2003.

Row	Tillage	Herbicide Treatment‡				
Spacing	Method†	PP+ 3 wks	3 wks	3 + 2 wks	10 wks	Avg.
		---------------------------- Soybean Yield (bu/a) -------------------------				
7.5-in.	CT	31.8	33.3	32.8	21.3	29.8
15-in.	CT	32.1	32.4	35.1	23.7	30.8
30-in.	CT	31.8	32.8	33.5	21.1	29.8
7.5-in.	NT	32.4	32.8	33.0	27.0	31.3
15-in.	NT	34.5	33.9	34.6	26.5	32.4
30-in.	NT	31.1	32.9	31.1	20.6	28.9
Means:						
Row	7.5-in.	30.5				
spacing	15-in.	31.6				
	30-in.	29.4				
	LSD 0.05	1.2				
Tillage	CT	30.2				
	NT	30.9				
	LSD 0.05	NS				
Herbicide	PP+ 3 wks	32.3				
	3 wks	33.0				
	3 + 2 wks	33.4				
	10 wks	23.4				
	LSD 0.05	0.9				

† CT = conventional tillage (disk - chisel - disk - field cultivate); NT = no tillage.
‡Herbicide treatments consisted of postemergent applications of glyphosate. Full rate (1 qt/a) at 3 wks after planting and reduced rate (1 pt/a) at 5 wks after planting. Control treatment (10 wks after planting) consisted of 1.5 qt/a of glyphosate. Preplant (PP) treatment consisted of Prowl applied at 2.4 qt/a.

Table 2. Effects of Tillage, Row Spacing, and Herbicide on Full-Season Soybean Yield Following Grain Sorghum, Columbus Unit, 5-YR Average, 1999 - 2003.

Row Spacing	Tillage Method†	Herbicide Treatment‡ PP+ 3 wks	3 wks	3 + 2 wks	10 wks	Avg.
		---------------------------- Soybean Yield (bu/a)			-------------------------	
7.5-in.	CT	23.6	24.4	24.5	19.3	22.9
15-in.	CT	25.2	25.1	26.0	21.8	24.5
30-in.	CT	23.7	23.5	24.5	17.1	22.2
7.5-in.	NT	25.9	26.7	25.9	22.1	25.1
15-in.	NT	25.6	25.1	25.2	20.9	24.2
30-in.	NT	24.4	24.3	24.7	18.0	22.9
Means:						
Row	7.5-in.	24.0				
spacing	15-in.	24.4				
	30-in.	22.5				
	LSD 0.05	1.3				
Tillage	CT	23.2				
	NT	24.1				
	LSD 0.05	NS				
Herbicide	PP+ 3 wks	24.7				
	3 wks	24.8				
	3 + 2 wks	25.1				
	10 wks	19.9				
	LSD 0.05	0.4				

† CT = conventional tillage (disk - chisel - disk - field cultivate); NT = no tillage.
‡Herbicide treatments consisted of postemergent applications of glyphosate. Full rate (1 qt/a) at 3 wks after planting and reduced rate (1 pt/a) at 5 wks after planting. Control treatment (10 wks after planting) consisted of 1.5 qt/a of glyphosate. Preplant (PP) treatment consisted of Prowl applied at 2.4 qt/a.

EFFECT OF SOIL pH ON CROP YIELD

Kenneth W. Kelley

Summary

Grain yields of grain sorghum, soybean, and wheat increased as soil acidity decreased. Yields were greatest, however, when pH was near the neutral range of 7.0.

Introduction

In southeastern 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. But applying too much lime can result in alkaline soil conditions (pH greater than 7.0), which also reduces nutrient availability and increases persistence of some herbicides. This research evaluated crop yield responses to varying levels of soil pH.

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 in a 3-yr crop rotation consisting of [wheat - double-cropped soybean] - grain sorghum - soybean. Crops are grown with conventional tillage.

Results and Discussion

Grain yield responses for the various soil pH treatments over several years are shown in Table 1. Yields of all crops increased as soil acidity decreased. Yields generally were greatest, however, when soil pH was near the neutral range of 7.0. Plant nutrient availability (nitrogen and phosphorus) also increased as soil acidity decreased (data not shown).

Table 1. Effects of Soil pH on Crop Yields, Parsons Unit, Southeast Ag Research Center.

	Grain Yield			
	Grain Sorghum	Full-Season Soybean	Double-Crop Soybean	Wheat
Soil pH	(4-yr avg)	(3-yr avg)	(3-yr avg)	(3-yr avg)
(0 - 6 in.)	bu/a	bu/a	bu/a	bu/a
4.9	83.8	26.5	17.6	45.4
5.3	89.9	28.7	20.3	46.1
6.1	96.3	32.8	22.0	47.3
6.5	99.3	33.4	23.3	49.1
7.0	99.0	34.3	22.3	48.2
LSD 0.05	4.2	2.3	1.1	2.7

EFFECTS OF TILLAGE ON FULL-SEASON SOYBEAN YIELD

Kenneth W. Kelley and Daniel W. Sweeney

Summary

Full-season soybean yields have differed over time with tillage method at two different sites. In general, when drier- than -normal conditions occur, soybean yields have been greater when soybean were planted no-till following corn or grain sorghum; when summer rainfall is above normal, however, tillage has had less effect on full-season soybean yield.

Introduction

In southeastern Kansas, full-season soybean often are rotated with other crops, such as corn and grain sorghum, to diversify cropping systems. Previously, soybean have been planted with conventional tillage (chisel - disk - field cultivate) following corn or grain sorghum; but improved equipment technology has made no-till planting more feasible. Thus, this research evaluates the long-term effects of tillage method on full-season soybean yield.

Experimental Procedures

From 1995 through 2002, a 3-yr crop rotation was evaluated both at the Columbus and Parsons Units. The rotation consisted of [corn or grain sorghum] - soybean - [wheat and double-crop soybean], and tillage effects on full-season soybean yields were evaluated every 3 yrs. Tillage treatments were: 1) plant all crops with conventional tillage (CT); 2) plant all crops with notillage (NT) and 3) alternate CT and NT systems. Beginning in 2003, the 3-yr rotation was changed to a 2-yr rotation, which consisted of soybean following grain sorghum. Tillage effects on soybean yield were evaluated each year both at the Columbus and Parsons Units.

Results and Discussion

Effects of tillage method on full-season soybean yields are shown in Table 1. At the Columbus Unit, soybean yields were greater with CT than with NT during the first two cropping cycles. In 2002 and 2003, however, when drier-than- normal conditions existed, NT soybean yields were similar to CT. At the Parsons Unit, tillage systems had no significant effect on soybean yields in 1996 and 1999. But in 2002 and 2003, soybean yields were often greater for NT than CT.

Results suggest that the effects of tillage on soybean yields have changed over time. Additional research is needed to evaluate long-term effects on soybean yield.

Table 1. Effects of Tillage Systems on Full-Season Soybean Yield, Southeast Agricultural Research Center, 1996 - 2003.

	Full-Season Soybean Yield			
Tillage system	1996†	1999†	2002†	2003‡
	---------------------------------- bu/a ----------------------------------			
	Columbus Unit			
NT only	48.4	18.1	27.0	35.7
NT following CT	46.0	14.2	26.0	29.3
CT only	53.9	20.3	23.4	35.8
CT following NT	54.4	20.0	26.5	36.9
LSD 0.05:	4.9	1.3	1.4	2.0
	Parsons Unit			
NT only	45.3	15.8	32.4	34.9
NT following CT	43.7	14.9	32.1	33.5
CT only	45.2	15.5	27.9	30.8
CT following NT	45.8	16.0	29.6	35.1
LSD 0.05:	NS	NS	3.9	2.8

† Effects of previous crop (corn and grain sorghum) on soybean yield were non-significant (NS) for the first phase of the study from 1996 through 2002; thus, yields were averaged over both previous crops.
‡ Previous crop was grain sorghum.
NT = notillage.
CT = conventional tillage (chisel - disk - field cultivate).

EFFECTS OF NITROGEN AND PREVIOUS DOUBLE-CROPPING OPTIONS ON SUBSEQUENT CORN YIELD

Kenneth W. Kelley and Joseph L. Moyer

Summary

Corn yields were greatest following wheat - double-crop soybean and least following wheat - double-crop grain sorghum. Averaged over six different wheat - double-crop options, corn yields were 82 bu/a for zero N, 111 bu/a for 80 lb N/a, and 136 bu/a for 160 lb N/a. But corn yield response to fertilizer N differed with previous wheat - double-crop option.

Introduction

In southeastern Kansas, producers typically double-crop soybean after wheat. But other double-crop options are suitable for the growing conditions of this region. Grain sorghum can be successfully grown as a double-crop option if planted by early July. If wet conditions follow wheat harvest, double-crop sunflower can be planted as late as mid- to late July and still mature before the average killing frost. Small-seeded legumes offer another option after wheat harvest. Legumes, such as lespedeza or sweet clover, typically are seeded into wheat in early spring. Lespedeza is commonly grown for seed or cut for hay, whereas, sweet clover is planted primarily for soil amendment purposes. Other producers may fallow the land after wheat harvest. In fallow situations, weeds often are controlled with a summer application of herbicide, such as glyphosate.

Previous wheat and double-crop options likely affect growth of subsequent crops, such as corn. In addition, fertilizer N requirements for corn may need to be adjusted, depending upon previous wheat - double-crop option.

Experimental Procedures

The study was conducted at the Parsons Unit, and the experimental design was a split-plot arrangement with three replications. Main plots consisted of six different wheat - double-crop options that were grown in 2002: 1) wheat - double-crop soybean, 2) wheat - double-crop grain sorghum, 3) wheat - double-crop sunflower, 4) wheat - lespedeza, 5) wheat - sweet clover, and 6) wheat - chemical fallow. Double-crop grain sorghum and sunflower plots each received 75 lb N/a as ammonium nitrate. Subplots consisted of three preplant fertilizer N rates (0, 80, and 160 lb N/a) for corn following wheat - double-crop options. Corn yield, leaf N concentration, and grain N content were determined for main and subplot factors.

Results and Discussion

In 2003, corn yields, averaged over all N rates, were greatest following wheat - double-crop soybean and lowest following wheat - double-crop grain sorghum (Table 1). The effect of previous double-crop options on corn yield was greatest at the zero and 80 lb N rate, indicating that previous plant residues were affecting N management. At the high N rate, differences in corn yield between previous double-crops were less pronounced than at lower N rates. In 2002, sweet clover stands were marginal in some plots, which likely affected subsequent corn yield responses.

Table 1. Effects of Nitrogen and Previous Wheat - Double-crop Options on Subsequent Corn Production, Parsons Unit, Southeast Agricultural Research Center, 2004.

Previous Double-crop	N rate	Corn Yield	Corn Leaf N	Corn Grain N
	lb N/a	bu/a	%	%
Chemical Fallow	0	82.2	1.50	1.09
	80	111.7	2.20	1.18
	160	134.0	2.45	1.24
Lespedeza	0	90.1	1.36	1.10
	80	100.6	1.85	1.18
	160	124.7	2.43	1.20
Sweet clover	0	81.1	1.59	1.10
	80	108.7	1.76	1.15
	160	132.4	2.40	1.22
Soybean	0	91.8	1.39	1.10
	80	132.8	2.42	1.21
	160	156.3	2.71	1.20
Grain sorghum	0	52.3	1.21	1.11
	80	81.7	1.63	1.11
	160	130.1	2.19	1.22
Sunflower	0	95.8	1.60	1.10
	80	132.2	2.37	1.24
	160	137.0	2.54	1.17
LSD 0.05:		23	0.4	0.11

HERBICIDE RESEARCH

Kenneth W. Kelley

Summary

Herbicide performance evaluations with corn, grain sorghum, soybean, and cotton were conducted in 2003. Complete results of the various herbicide research studies are available from the author.

Introduction

Chemical weed control is an important management tool for row crop production. In recent years, new technology has provided several different methods to control weeds, especially for crops like corn and soybean. Herbicide research trials are conducted annually to evaluate new and commonly used herbicide products for effects on weed control and grain yield.

Experimental Procedures

In 2003, herbicides for use with corn, grain sorghum, and soybean were evaluated at the Columbus Unit. Research on herbicides for use with cotton was conducted at the Parsons Unit. All trials were replicated three times. Herbicide treatments were applied with a tractor-mounted compressed air sprayer. Weed control ratings were made during the summer. Grain yields were determined for soybean and grain sorghum crops.

Results and Discussion

Complete results of the various herbicide studies conducted in 2003 can be obtained by contacting the author (kkelley@oznet.ksu.edu).

PERFORMANCE TEST OF DOUBLE-CROPPED SOYBEAN VARIETIES

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

Summary

Fourteen double-cropped soybean varieties were planted no-till following winter wheat at the Columbus unit and evaluated for yield and other agronomic characteristics throughout the summer of 2003. Overall, grain yields were very good; with the mid-season drought conditions, variety differences were seen. Yields ranged from 20.6 bu/a to 32 bu/a, with grain yields being strongly related to maturity. Maturity Group (MG) V varieties had the greatest yields.

Introduction

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

Experimental Procedures

Soybean varieties were planted no-till into good moisture following winter wheat harvest at the Southeast Agricultural Research Center at Columbus. The soil is a Parsons silt loam. The wheat stubble was burned, and soybeans were then planted with a John Deere 7000 planter. Three pints of Squadron®and 3 oz. of Authority®per acre were sprayed after planting. Authority was used because of previous morning glory infestations in the field where the trial was grown. Round-up-tolerant varieties were used. Soybeans were planted on June 23, 2003, at 10 seed per ft of row. Harvest occurred October 23, 2003.

Results and Discussion

Soils were moist after rains throughout May, June, and early July, and plant stands were excellent. Excellent growing conditions prevailed early, but drought occurred in late July and August. September rains provided for excellent yields of almost 30 bu/a in later-maturity varieties.

Yields ranged from 20.6 bu/a to 32 bu/a (Table 1). Several varieties yielded more than 28 bu /a, and could be considered top yielders in 2003. Maturity played a large role in determining top yields, with later-maturing varieties catching the September rains to improve pod set and retention. Overall plant heights were good, reflecting the moist early conditions.

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[1] Southeast Area Extension Office.

Table 1. Yields from 2001-2003 for a Variety Test of Double-Cropped Soybean at Columbus and Parsons.

Brand	Variety	Maturity	Height	Grain Yield		
				2001	2002	2003
		From 10/1	-in-	-------bu/a--------		
Midland	9A523NRR	19.3	28.3	--	22.3	29.4
Midland	9A564NRS	23.5	25.5	--	--	27.3
Monsanto	AG4603	13.8	24.5	--	--	22.5
Monsanto	AG4403	7.8	23.0	--	--	20.7
Pioneer	94B73	7.8	22.8	17.3	--	20.6
Pioneer	95B32	22.5	22.3	14.0	21.3	27.4
Pioneer	95B42	20.8	29.8	--	22.0	29.8
Stine	S5002-4	11.8	27.8	--	--	26.3
Stine	S5142-4	15.0	27.0	--	--	26.9
Stine	S5302-4	24.0	27.0	--	20.2	29.9
Syngenta	S57-P1	21.0	27.5	--	20.1	32.0
Syngenta	X349R	21.5	30.3	--	--	27.7
KSU	K1539RR	10.5	21.8	--	--	22.5
KSU	K1550RR	23.8	22.3	--	--	29.4
Average		17.4	25.7	16.9	19.1	26.6
LSD 0.05		2.9	3.5	2.7	4.4	4.0

PERFORMANCE TEST OF RIVER-BOTTOM SOYBEAN VARIETIES

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

Summary

Twelve 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 2003. Grain yields were good, and variety differences were seen with this very productive soil. Yields ranged from 34.3 to 41.8 bu/a. The shorter-season Maturity Group (MG) III and IV varieties yield as well as or better than MG V varieties when grown on deep soils.. The soybeans were not tall, and there was no significant lodging.

Introduction

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

Experimental Procedures

Twelve soybean varieties were grown after corn in 2002. The farmer/cooperator was Joe Harris. The soil is a Lanton deep silt loam that sits on the Neosho River flood plain approximately 1750 feet from the river channel. The soil was chiseled and disked, Dual II® herbicide was applied at the rate of 3 pints /a, and the soil was field cultivated before planting. Soybean was planted on June 17, 2003 at 10 seeds/ft of row. Plants emerged to form an excellent stand. All varieties were Round-up tolerant, and 22 oz/a of Roundup Weathermax® herbicide was applied postemergent 28 days after planting. The soybeans were harvested on October 21, 2003

Results and Discussion

Warm and moist conditions persisted until mid July, then it became hot and dry. Soybean grew well throughout the season because of the deep moisture.

Yields ranged from 34.3 bu/a to 41.8 bu/a (Table 1). Several varieties yielded more than 40 bu/a for the 2003 growing season. Consideration should be given to plant height and its effect on lodging as well as plant maturity. Overall plant height ranged from 26 to 36 in. Most varieties in these maturity ranges are indeterminate in growth habit.

[1] Southeast Area Extension Office

Table 1. Yields from 2001-2003 for a Variety Test of River-Bottom Soybean at Erie, Kansas.

Brand	Variety	Maturity	Height	Grain Yield		
				2001	2002	2003
		From 10/1	-in	------------bu/a------------		
Midland	9A442NRR	6.5	35.0	--	40.3	41.0
Midland	9A432NRS	3.8	31.3	--	--	37.7
Monsanto	AG4603	7.5	32.5	--	--	41.8
Monsanto	AG4403	4.8	33.3	--	--	41.7
Pioneer	93B85	2.8	30.3	41.2	39.0	37.8
Pioneer	94B13	3.0	33.5	--	35.7	36.2
Pioneer	94B73	0.0	36.0	--	--	38.7
Stine	S4443-4	5.5	28.5	--	--	40.0
KSU	K1552RR	4.0	29.0	--	--	34.3
KSU	K1594RR	4.0	28.8	--	--	39.0
KSU	K1583RR	2.3	26.0	--	--	34.7
KSU	K1582RR	3.8	29.5	--	--	39.1
Average		4.0	31.1	37.4	40.9	38.5
LSD 0.05		1.5	2.1	4.9	2.5	4.3

SEED TREATMENT EFFECT ON PLANT STAND AND GRAIN YIELD OF CORN

Douglas J. Jardine[1] and James H. Long

Summary

Sixteen seed treatments for corn were planted following soybean at the Parsons unit and evaluated for yield and plant stand during the summer of 2003. Overall, grain yields were very good, and seed treatment differences were seen. Yields ranged from 118.7 bu/a to 138.4 bu/a. Plant stands ranged from 11.0 to 13.3 plants/10ft. The untreated check had the poorest stand and the least grain yield.

Introduction

Corn is planted in Southeastern Kansas from late March to early April and can undergo severe weather related stress from the time it is planted until it is established and growing. The use of seed treatments to promote seedling establishment is an accepted practice, however, there can be a wide range in protective abilities of these products. In an effort to determine best treatments for corn seed, a test was run in 2003 at the Parsons unit of the Southeast Agricultural Research Center (SEARC).

Experimental Procedures

Plots were established after chemical seed treatments were applied to the seed as a slurry with a commercial seed treater. Seeds were planted April 3, 2003. Plots consisted of four 25-ft long rows. Stand counts and grain yields were taken from the middle two rows of each plot. Stand counts were taken May 6 and plots were harvested for grain on August 26. Yields were adjusted to 15% moisture and 56 lb/bu.

Results and Discussion

All treatments except two, Maxim® XL 2.7 FS 0.056 fl oz and Maxim® XL 2.7 FS 0.056 fl oz + Protege® 0.83 FS 0.016, had increased stand counts compared with the untreated check at Parsons (Table 1). Nine of these treatments also had greater grain yields than did the check. Eight treatments averaged more than 12.3 plants/10 ft, and 7 treatments had greater than 12.3 plants/10 ft and almost 130 bu/a or greater grain yields. Several treatments gave excellent protection to early planted corn seedlings and resulted in increased grain yield.

[1] Extension Plant Pathologist, KSU.

Table 1. Effects of Seed Treatment Fungicides on Stand and Yield of Corn at Parsons, Kansas, 2003. [1]

Treatment rate/cwt (a.i.)	Stand (Plants/10ft)		Yield (bu/a)	
Untreated check	11.0	e**	118.7	e
A14075A FS 0.9 fl oz	12.1	bcd	124.8	cde
A14075A FS 1.8 fl oz	13.3	a	125.9	cde
A14075B FS 0.9 fl oz	12.5	abc	126.7	cde
A14075B FS 1.8 fl oz	12.8	ab	130.2	abcd
A14115A FS 0.9 fl oz	12.4	abc	130.6	abcd
A14117A FS 0.9 fl oz	12.8	abc	132.0	abc
Maxim XL 2.7 FS 0.056 fl oz + Protege .83 FS 0.016 fl oz + Cruiser 5 FS 1.66 fl oz	12.8	abc	129.9	abcd
Maxim XL 2.7 FS 0.112 fl oz + Protege .83 FS 0.032 fl oz + Cruiser 5 FS 1.66 fl oz	12.4	abc	136.8	ab
A13641A FS 0.9 fl oz	12.2	bc	124.6	cde
A13641A FS 1.8 fl oz	13.3	a	132.2	abc
Maxim XL 2.7 FS 0.056 fl oz + Cruiser 5 FS 1.66 fl oz	12.3	abc	138.4	a
Maxim XL 2.7 FS 0.056 fl oz	11.2	de	125.6	cde
Maxim XL 2.7 FS 0.056 fl oz + Protege .83 FS 0.016 fl oz	11.8	cde	129.5	bcd
Maxim XL 2.7 FS 0.056 fl oz + Apron XL 3 LS 0.016 fl oz	12.1	bcd	122.7	de
Captan 4L o.88 fl oz + Allegiance FL 0.032 fl oz + Gaucho 600 FS 1.06 fl oz	12.2	bc	131.0	abcd
CV%	5.5		5.7	

** Means within columns followed by the same letter are not significantly different (FLSD P=0.05)

[1] Table data from Jardine, D. J., B. Gordon, K. Janssen, and J. H. Long. 2004. Effects of seed treatment fungicides on stand and yield of corn. Fung. Nem. Tests. Report 54. (In Press).

EVALUATING CHARCOAL ROT RESISTANCE IN SOYBEAN

Douglas J. Jardine[1] and James H. Long

Summary

Twenty-three soybean breeding lines planted following soybean at the Columbus unit were evaluated for yield and plant color/ health during 2003. Overall, grain yields ranged from poor to average and were affected by a moderate amount of disease pressure. Differences between maturity groups and individual breeding lines within maturity groups (MG) were seen. Yields ranged from 13.5 bu/a to 31.2 bu/a. Plant charcoal rot ratings ranged from 1.7 to 3.3, with 1.7 being minor yellowing of plant leaves and 3.3 being moderate yellowing of leaves.

Introduction

Soybean is a major crop in Southeast Kansas. It is afflicted with charcoal rot (*Macrophomina phaseolina*) annually during stress periods, especially July and August, when high temperatures and dry conditions weaken the plant as it moves into reproductive growth (flowering). Although there are varieties that are known to be more severely affected by this disease there has been no known resistance to it. Recently several breeding lines have been identified that might have the ability to withstand charcoal rot and allow for greater grain yield. To determine if these breeding lines could affect incidence of charcoal rot, in 2003, under Kansas conditions breeding lines were tested at the Southeast Agricultural Research Center at Columbus, Kansas.

Experimental Procedures

Plots were established on June 5, 2003, at the Columbus field of the Southeast Agricultural Research Center. These plots consisted of four 25-ft long rows, spaced 30 inches between the rows. Grain yields were taken from the middle two rows of each plot. Disease ratings were taken August 29 and plots were harvested for grain on October 6 (MG 3 and 4) and October 23 (MG5). Yields were adjusted to 13% moisture and 60 lb/bu.

Results and Discussion

There were significant differences in both disease ratings and grain yields among the lines. Maturity group 3 and 4 lines typically had greater disease ratings and poorer grain yields (2.7 and 18.0) than did the MG 5 lines (2.3 and 29.9) shown in Table 1. This study indicates that there are several lines that show promise in reducing charcoal rot effect in soybean.

[1] Extension Plant Pathologist, KSU.

Table 1. Charcoal rot rating and grain yield in 2003 of soybean breeding lines at Columbus unit, Southeast Agricultural Research Center. *

Genotype	Maturity Group	Charcoal rot rating **		Yield (bu/a)
LS98-0265	3	3.0	ab***	13.5 j
GX98-0609	3	3.3	a	17.3 fghij
LS93-0375	4	2.5	ab	15.7 hij
LS97-1218	4	2.7	ab	14.1 ij
LS98-0719	4	2.5	ab	19.2 fgh
LS98-1430	4	2.5	ab	19.5 fg
LS98-2214	4	2.3	ab	18.9 fgh
LS98-2248	4	2.5	ab	19.5 fg
LS98-2574	4	2.7	ab	17.0 fghij
LS98-3257	4	1.7	b	20.3 ef
LS98-3032	4	3.3	a	18.7 gh
LS98-0358	4	3.3	a	16.1 ghij
LS98-1612	4	2.2	ab	23.2 de
PHARAOH	4	3.0	ab	18.9 fgh
LS98-0373	5	2.7	ab	18.7 fgh
LS98-3645	5	2.0	ab	30.2 ab
LS92-1088	5	2.7	ab	27.2 bc
LS96-1631	5	2.3	ab	28.5 abc
97-4290	5	2.3	ab	25.9 cd
99-17554	5	1.7	b	27.9 abc
99-17483	5	2.0	ab	28.0 abc
99-16864	5	1.7	b	31.2 a
98-7553	5	2.7	ab	26.5 cd
CV%		38.1		24.7

* Table data from Jardine, D.J., and J. H. Long. 2004. Evaluation of soybean breeding lines for resistance to charcoal rot. Biological and Cultural Tests for Control of Plant Diseases (In Press).
**Rating scale 1 = no yellowing, 2 = minor yellowing, 3 = moderate yellowing, 4 = almost entirely yellowed, 5 = dead.
***Means within columns followed by the same letter are not significantly different (FLSD P=0.05).

PERFORMANCE TEST OF COTTON VARIETIES

James H. Long, Gary Kilgore, Scott Staggenborg, and Stewart Duncan [1]

Summary

Ten cotton varieties were planted at Parsons, Kansas, and were evaluated for yield and other agronomic characteristics throughout the summer of 2003. Lint yields were very good and variety differences were seen. Yields ranged from 627 lb/a to 918 lb/a of lint. Quality is reported on the individual varieties. Quality should be strongly considered because it will affect the final price of the crop.

Introduction

Cotton is a new crop for southeastern Kansas but is already grown on nearly 100,000 acres in the state. The crop is somewhat drought tolerant. Many of the varieties tested are grown on the high plains of Texas and in Oklahoma. Some factors that may influence the amount of cotton grown in this region are potential insect problems and the management decisions associated with cotton, such as having an early harvest before fall rains arrive.

Experimental Procedures

Ten cotton varieties were grown following soybean in 2002. The soil at the Parsons unit of the Southeast Agricultural Research Center is a Parsons silt loam. The soil was disked twice. Treflan® herbicide was applied, and then the soil was field cultivated before planting. Cotton was planted on May 31, 2003. Cotoran® and Staple® were applied pre-emergent to help control broadleaf weeds. Target populations were to 43,000 and 87,000 plants/acre. Plants emerged to form an adequate stand. Cotton lint was harvested on November 12, 2003. The cotton was ginned at Manhattan and lint quality was then determined by HVI (high volume instrumentation) testing.

Results and Discussion

Normally moist conditions persisted until July, then it became hot and dry. July had only 70% of normal rainfall but 110% of normal growing degree days. August was hot but very wet, with nearly 250% of normal precipitation. The cotton grew well throughout the season, even with the lack of moisture in July. Yields ranged from 627 lb/a to 918 lb/a (Table 1). DP&L 2145RR yielded more than 900 lb/a lint for the 2003 growing season and should be considered the top yielder. There are three years of data for cotton lint yields in Table 2. Several varieties have above-average yields over that period. Quality characteristics indicate differences between varieties that may affect the price at the gin and these should be considered, especially if the qualities are much poorer than average. Turnout was high again this year due, in part, to a burr extractor on the cotton stripper.

[1] Southeast Agricultural Research Center, Southeast Area, Northeast Area, and South Central Area extension agronomists, respectively.

Table 1. Yield and Quality of Cotton Varieties in 2003 at Parsons Unit, Southeast Agricultural Research Center.

Brand	Variety	Lint Yield lb/a	Turn out %	Mic.	Length in	Uniformity %	Strength g/tex	Color	Grade
AFD	3511RR	627	0.31	4.3	1.03	80.6	29.3	62	2
DP&L	2145RR	918	0.36	4.8	0.94	79.4	28.5	51	3
DP&L	2167RR	800	0.34	4.7	0.98	79.2	30	62	1
DP&L	2266RR	647	0.32	4.7	1.04	80	30	82	1
DP&L	2280BGRR	871	0.33	4.2	1.04	80.7	32.3	52	2
DP&L	DP5415RR	772	0.33	4.8	1.07	80.7	29.8	52	2
Stone-ville	ST2454R	578	0.32	4.2	1.04	80.6	30.8	52	1
Stone-ville	ST3539BR	711	0.33	4.6	1.01	80.1	30.8	41	4
Stone-ville	STX1553R	771	0.31	3.6	1.11	80.8	31.1	42	2
Stone-ville	STX2448R	697	0.31	3.8	1.02	80.1	29.8	41	1
	Average	739	0.33	4.3	1.03	80.2	30.2	--	--
	CV (%)	13	6	6	3	1	4	--	--
	LSD 0.05	109	0	0.6	0.06	2.6	2.8	--	--

Table 2. Average Yield of Cotton Varieties from 2001-2003 at Parsons Unit of the Southeast Agricultural Research Center.

		Cotton Lint Yield				
Brand	Variety	2003	2002	2001	2-Yr Avg	3-Yr Avg
		----------lb/a----------				
AFD	3511RR	627	--	--	--	--
DP&L	2145RR	918	778	888	848	861
DP&L	2167RR	800	621	842	710	754
DP&L	2266RR	647	572	942	609	720
DP&L	2280BGRR	871	615	887	743	791
DP&L	DP5415RR	772	--	--	--	--
Stone-ville	ST2454R	578	521	876	550	659
Stone-ville	ST3539BR	711	--	--	--	--
Stone-ville	STX1553R	771	--	--	--	--
Stone-ville	STX2448R	697	--	--	--	--
Average		739	598	893	669	743
CV (%)		13	18	9	--	--
LSD 0.05		109	125	95	--	--

SOUTHEAST AGRICULTURAL RESEARCH CENTER
KANSAS STATE UNIVERSITY

ANNUAL SUMMARY OF WEATHER DATA FOR PARSONS, KANSAS - 2003

Mary Knapp[1]

2003 DATA

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Avg. Max	41.1	43.3	55.8	68.5	76.1	81.1	91.5	94.4	77.0	71.0	54.8	47.4	66.8
Avg. Min	19.5	22.7	34.1	45.2	54.3	61.0	69.4	68.3	54.7	46.4	35.9	28.7	45.0
Avg. Mean	30.3	33.0	45.0	56.9	65.2	71.1	80.5	81.3	65.9	58.7	45.4	38.0	55.9
Precip	0.30	1.49	3.89	4.82	5.40	4.78	2.39	6.18	3.51	2.47	2.89	3.44	41.56
Snow	3.0	5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	20.0
Heat DD*	1075	896	622	264	60	22	0	0	54	211	600	836	4637
Cool DD*	0	0	0	19	66	204	479	507	80	15	10	0	1378
Rain Days	3	6	11	9	9	9	4	9	8	6	7	6	87
Min < 10	5	5	0	0	0	0	0	0	0	0	1	0	11
Min < 32	30	24	14	3	0	0	0	0	0	0	9	24	104
Max > 90	0	0	0	0	0	3	22	22	0	0	0	0	47

NORMAL VALUES (1971-2000)

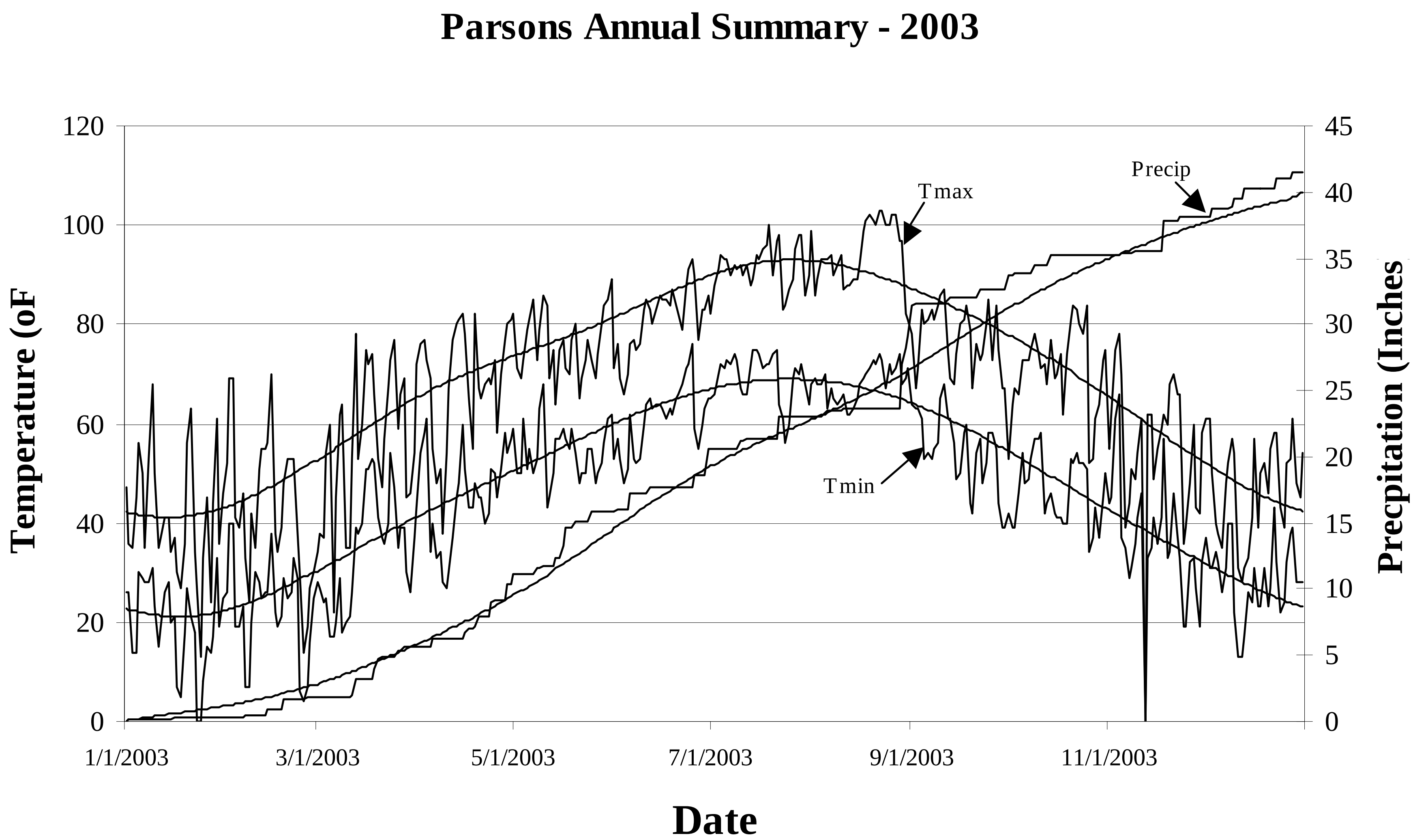
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Avg. Max	40.2	47.2	57.2	67.1	76	85	91.1	90	81	70.5	55.5	44.4	67.1
Avg. Min	20.2	25.6	34.8	44.1	54.4	63.4	68.3	66	58	46.3	34.9	24.8	45.1
Avg. Mean	30.2	36.4	46	55.6	65.2	74.2	79.7	78	69.5	58.4	45.2	34.6	56.1
Precip	1.37	1.78	3.37	3.82	5.39	4.82	3.83	3.42	4.93	4.04	3.29	2.03	42.09
Snow	2	3	1.5	0	0	0	0	0	0	0	2	0	8.5
Heat DD	1079	800	590	295	95	6	0	3	51	229	594	942	4684
Cool DD	0	0	0	13	101	283	456	406	187	24	0	0	1470

DEPARTURE FROM NORMAL

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Avg. Max	0.9	-3.9	-1.4	1.4	0.1	-3.9	0.4	4.4	-4.0	0.5	-0.7	3.0	-0.3
Avg. Min	-0.7	-2.9	-0.7	1.1	-0.1	-2.4	1.1	2.3	-3.3	0.1	1.0	3.9	-0.1
Avg. Mean	0.1	-3.4	-1.0	1.3	0.0	-3.1	0.8	3.3	-3.7	0.3	0.1	3.4	-0.2
Precip	-1.07	-0.29	0.52	1	0.01	-0.04	-1.44	2.76	-1.42	-1.57	-0.4	1.41	-0.53
Snow	1.0	2.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	10.0	11.5
Heat DD	-4	96	32	-32	-35	16	0	-3	3	-19	6	-107	-48
Cool DD	0	0	0	6	-36	-80	23	101	-108	-9	10	0	-92

* 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.



Parsons Annual Summary - 2003
Temperature (oF
Precpitation (Inches
Date
Tmax
Tmin
Precip
120
100
80
60
40
20
0
45
40
35
30
25
20
15
10
5
0
1/1/2003
3/1/2003
5/1/2003
7/1/2003
9/1/2003
11/1/2003

SCIENTIFIC NAMES OF CROPS LISTED IN THIS PUBLICATION

Common Name	Scientific Name (*Genus species*)
Alfalfa	*Medicago sativa* L.
Bermudagrass	*Cynodon dactylon* (L.) Pers.
Big bluestem	*Andropogon gerardi* Vit.
Corn	*Zea mays* L.
Cotton	*Gossypium hirsutum* L.
Crabgrass	*Digitaria sanguinalis* (L.) Scop.
Grain sorghum	*Sorghum bicolor* (L.) Moench
Hairy vetch	*Vicia villosa* Roth
Indian grass	*Sorghastrum nutans* (L.) Nash
Korean lespedeza	*Lespedeza stipulacea* Maxim.
Sand bluestem	*Andropogon halii* Hack.
Striate lespedeza	*Lespedeza striata* Hook. and Arn
Soybean	*Glycine max* (L.) Merr.
Sunflower	*Helianthus annuus* L.
Tall fescue	*Festuca arundinacea* Schreb.
Wheat	*Triticum aestivum* L.

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