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Kansas State University, Manhattan
John O. Dunbar, Director

Southeast Kansas Branch Station

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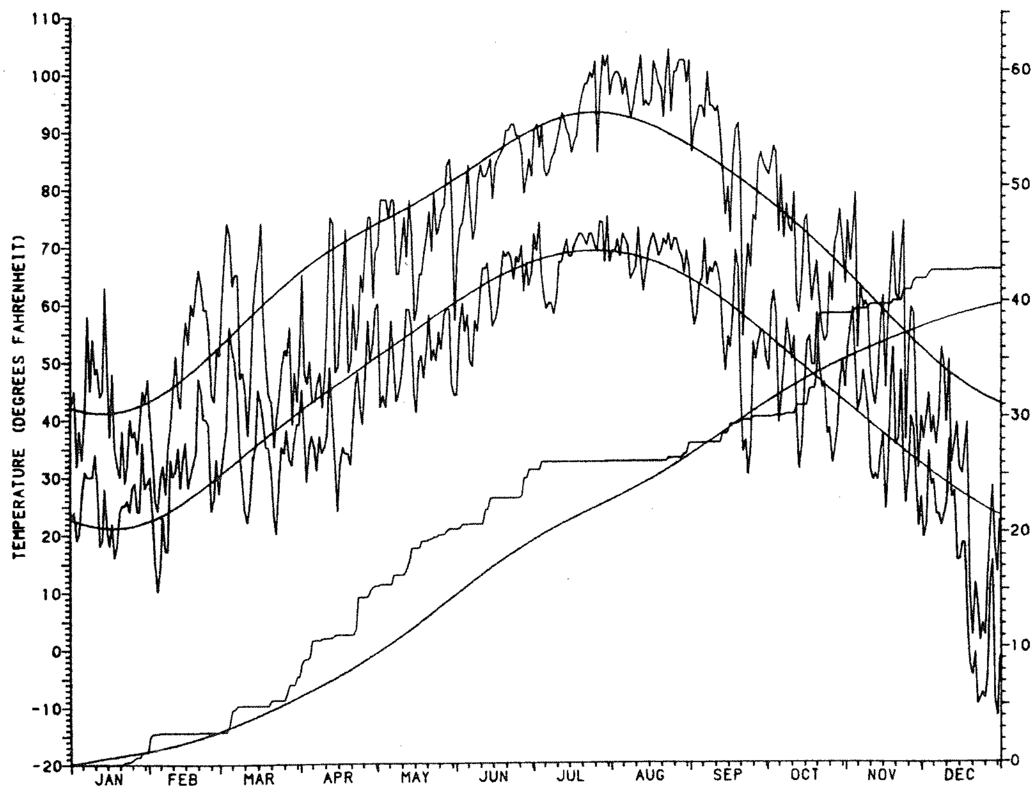
Agricultural Research at the Southeast Kansas Branch Experiment Station during 1983[1]

INTRODUCTION

Through annual research reports the Southeast Kansas Branch Experiment Station attempts to keep the area's consumers and producers of agricultural products informed on the Station's research accomplishments. In serving the area, we conduct research at fields located at Parsons, site of headquarters; at Mound Valley, the original location of the Branch Station; and at Columbus, which has been in the Kansas State University research system for over 60 years.

This report for 1983 covers five areas of research emphasis: Beef Cattle, Crops, Forages, Soil and Water Management, and Crop Varietal Development. We sincerely hope that it will be useful to area producers and consumers, industry cooperators, Extension personnel and others.



GRAPHICAL WEATHER SUMMARY FOR PARSONS 1983

PRODUCED WITH THE AID OF THE KANSAS AGRICULTURAL EXPERIMENT STATION WEATHER DATA LIBRARY

This chart summarizes temperatures and precipitation for 1983. It may help explain some of the reported experimental results that may be difficult to interpret because of weather effects.

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[1]Contribution no 84-321-S, Southeast Kansas Branch Experiment Station, Parsons, and Kansas Agricultural Experiment Station, Kansas State University, Manhattan.

CROP VARIETAL DEVELOPMENT

Richard W. Dougherty

Soybean Variety Performance Test

One-third of the total Kansas soybean acreage is located in southeastern Kansas. Development of higher yielding varieties adapted to the area and current information on new varieties should be of prime interest to area farmers.

Procedures: In 1983, 36 soybean varieties comprising maturity groups III, IV, and V were planted in 30-inch rows on June 10 at the Columbus field.

Results: Adequate moisture for good growth existed throughout June, however, conditions were extremely dry during July and August. Most varieties in maturity group III and IV were affected severely by charcoal rot. Yields of some commonly grown varieties are shown below. Complete variety results are compiled in Agric. Expt. Station Report of Progress 447.

Variety	Maturity Group	1983 Yield, bu/a	1981-83 Yield, bu/a
NS-27-29	V	18.3	- - -
Bay	V	16.8	- - -
Forrest	V	16.8	30.3
Asgrow 5474	V	16.2	29.9
DS-1	V	14.6	- - -
Asgrow 5618	V	12.3	28.9
Essex	V	8.6	28.1
Crawford	IV	8.3	23.5
Ring Around 480	IV	6.6	25.6
Ring Around 502	V	4.7	- - -
Sparks	IV	4.6	- - -
Douglas	IV	3.6	21.1
LSD .05		3.5	

Conclusions: Maturity group V varieties have given the most consistent high yields in southeastern Kansas. In earlier maturing varieties, yields generally are reduced from drought stress and charcoal rot at pod-filling time.

Comparison of the Effects of Captan and Apron on Soybean Stands and Yields

When poor environmental conditions exist during the soybean growing and harvesting seasons, seed quality and germination sometimes are reduced. Fungicides in the form of seed treatments may improve germination of poor soybean seed lots and consequently improve stands in the field.

Procedure: In 1983, poor seed lots of the varieties Crawford and Columbus were treated with Captan or Captan + Apron. Two identical tests were planted at the Columbus and Parsons experimental fields. Planting dates were June 10 at Parsons and June 17 in Columbus. Row spacing was 30 inches. The seeding rate was 9 seeds per foot of row.

Results: Seed treatments increased stands at both Parsons and Columbus (see Table 1). There were no real stand differences between the two seed treatments whether Captan was applied separately or with Apron. Even though stands were greater in treated seed plots, yields remained the same.

Conclusions: The seed treatments Captan and Captan + Apron were effective in increasing field stands of poor soybean seed lots. There appears to be no real advantage to combining the seed treatments. The preliminary data indicate no yield advantages from seed treatments, at least in a dry year such as 1983.

Table 1. Effect of Seed Treatments on Field Stands and Yields of Soybeans.

	Location			
	Parsons		Columbus	
Treatment	Stand, seeds/ft.	Yield, bu/a	Stand, seeds/ft.	Yield, bu/a
None	2.6	17.8	4.3	11.3
Captan	4.2	17.3	5.0	10.2
Captan + Apron	3.7	17.6	4.9	10.0
LSD .05	.73	1.8	.25	1.9

Effects of Planting Dates and Row Spacings on Early, Medium and Late Maturing Soybean Varieties

In southeastern Kansas, soybeans are planted both full season and as a second crop after wheat. Recently farmers also have begun planting both narrow and wide row spacings within the two cropping systems. The following study gives information on the responses of soybeans with different maturities to narrow and wide row spacings, when planted in the two cropping systems.

Procedures: In 1983, 10 soybean varieties and two soybean lines were planted at two planting dates and two row spacings at the Columbus field. Planting dates were June 13 and July 10. Row widths were 10 inches and 30 inches. Treflan was preplant incorporated. Fertilizer was broadcast and incorporated at the rate of 12 lbs/acre of N, 24 lbs/acre of P_2O_5 and 24 lbs/acre of K_2O. Charcoal rot disease ratings were taken on September 21 for the early plantings and October 12 for late plantings.

Results: Severe drought conditions occurred in Southeast Kansas during most of the later part of the growing season. Rainfall did occur very late in the growing season, however, which coupled with cooler early fall temperatures may have helped yields. Except for the group V variety, Bay, the late-planted, wide row spacing group yielded best (Table 2). Bay yielded best from early-planted, narrow row spacing but only slightly better when late-planted in wide rows. Charcoal rot disease ratings for varieties were generally worse for the early plantings. For most varieties, a higher disease rating resulted in a lower yield.

Conclusions: Preliminary data from this study indicate a different yield response of some varieties to early and late planting dates. Charcoal rot and drought were the main causes of low yields obtained in 1983. Maturity group V varieties generally had the highest yields and lowest charcoal rot ratings at both row spacings and planting dates. Most varieties did best when planted late in 30-inch row spacings. However, 1983 was probably not a typical year. Several more years of data are needed before any definite conclusions can be drawn from the response of the 12 soybean varieties to the two planting dates and row spacings.

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C. E. Caviness, soybean breeder, Dept. of Agronomy, Univ. of Arkansas, Fayetteville, AR

W. T. Schapaugh, research soybean geneticist, Dept. of Agronomy, KSU, Manhattan

Table 2. Yields, Yield Rankings, and Charcoal Rot Ratings of Soybean Varieties and Lines When Planted Early and Late at Two Row Spacings.

Maturity Group	Variety or Line	Narrow - Early[1]			Wide Early			Narrow - Late			Wide - Late[2]		
		Yield bu/a	Rank[3]	C.R.[4]	Yield bu/a	Rank[3]	C.R.[4]	Yield bu/a	Rank[3]	C.R.[4]	Yield bu/a	Rank[3]	C.R.[4]
III	Cumberland	5.8	10	9	9.4	6	8	6.7	11	6	13.0	10	3
	Sprite	11.3	6	6	10.8	5	4	11.1	6	3	14.3	8	2
	Calland	3.7	11	9	5.7	11	8	10.5	9	5	15.6	6	2
	Williams	11.0	7	7	8.6	7	6	8.4	10	4	13.3	9	2
IV	DeSoto	8.7	8	8	6.5	10	5	10.9	7	3	11.4	11	2
	Douglas	6.6	9	6	5.0	12	9	10.7	8	4	14.6	7	3
	Sparks	6.6	9	8	6.9	9	6	12.4	5	4	14.6	7	2
	Crawford	14.1	3	6	12.0	4	5	14.0	3	2	19.0	5	1
V	Essex	12.4	5	3	16.6	2	2	17.6	2	1	18.6	4	1
	K77-5063	13.8	4	3	7.9	8	3	13.0	4	1	21.6	2	1
	Bay	22.2	1	2	19.8	1	1	18.7	1	1	20.7	3	1
	K77-5062	14.6	2	2	12.3	3	2	14.0	3	1	22.2	1	1

1/ Narrow Rows = 10-inch spacing
Early Planting = June 13

2/ Wide Rows = 30-inch spacing
Late Planting = July 10

3/ Relative ranking of varieties within the one row spacing and planting date.

4/ Charcoal Rot Rating 1 = excellent; 10 = poor.

CROPS RESEARCH

Kenneth W. Kelley

Performance Testing of Small Grain Varieties

The small grain variety tests are conducted to help southeastern Kansas growers select varieties best suited for the area.

Procedure: In 1983, 30 wheat varieties, five barley varieties, and six spring oat varieties were compared. Wheat and barley varieties were planted October 12, while spring oats were planted March 15. Wheat plots were fertilized with 100 lbs N, 70 lbs P_2O_5, and 70 lbs K_2O per acre. Barley and spring oats were fertilized with 50 lbs N, 50 lbs P_2O_5, and 50 lbs K_2O per acre.

Wheat results: Wet and cool weather at the time of heading resulted in a severe outbreak of speckled leaf blotch which severely reduced grain yields of susceptible varieties. Lodging also was a major problem on varieties that were stressed from plant diseases. Three-year averages and 1983 results of the more common varieties for southeast Kansas are listed below. (Complete wheat results for Kansas are compiled in Agric. Expt. Station Report of Progress 439).

Wheat variety	1983 Yield, bu/a	1981-83 Yield, bu/a
Agripro Hawk	18	38
Agripro Wings	30	44
Arkan	51	49
Bounty 310 (hybrid)	66	--
Garst HR 64	34	--
Newton	30	41
Payne	64	49
Pro Brand 830	60	--
Tam 105	32	46
Vona	31	40
Pike (soft)	63	56
LSD .05	12	5

Wheat conclusions: Several wheat varieties appear to have more resistance to the plant diseases that are encountered when cool and wet conditions occur. Planting several of the leading varieties is good insurance against the unpredictable weather patterns experienced in southeast Kansas.

Spring oat results:

Variety	Yield, bu/a 1983	Yield, bu/a 1981-83	Test wt. lbs/wt.	Ht. in.	Lodging %	Maturity
Bates	112.4	80	36	44	55	June 5
Lang	95.9	74	32	39	13	June 5
Larry	92.5	66	32	41	12	June 7
Trio	93.9	62	33	45	67	June 7
Ogle	94.1	--	31	46	25	June 8
Multiline Lang	90.7	--	33	43	17	June 6
LSD .05	12	--	2	3	31	- - -

Conclusions: Bates, Lang, and Larry are the most popular varieties. Bates probably has the highest yield potential, but tends to lodge more severely.

Barley results:

Variety	1983 Yield, bu/a	Test wt. lbs/bu	Ht. in.	Lodging %	Maturity
Post	115.5	47	41	3	May 8
Kanby	88.1	47	42	80	May 8
Nebar	75.4	45	45	80	May 9
Paoli	65.1	47	45	90	May 7
Dundy	89.0	41	37	37	May 9
LSD .05	10.7	3	3	5	- - -

Conclusions: Post has been the best variety in recent years.

Selected Wheat Varieties Compared at Three Nitrogen Rates

Fertility requirements of the higher yielding, semi-dwarf and soft wheat varieties that now dominate the wheat acreage in southeastern Kansas have not been evaluated. Because of their higher yield potential, these new varieties may have higher fertility requirements than the old standard varieties.

Procedure: Beginning in 1980, selected hard and soft wheat varieties were compared against a standard variety at three levels of N (50, 100, and 150 lbs/a). Potassium was broadcast prior to planting at the rate of 75 lbs/a K_2O. Phosphate was banded with the seed at planting time at 50 lbs/a P_2O_5. Nitrogen was applied in late winter as ammonium nitrate. Since 1980 some varieties have been dropped and others added to the study.

Results: Grain yields in 1983 generally were highest at the lowest N rate, 50 lbs/a. As the N rate increased to 100 and 150 lbs/a, yields remained the same or decreased.

The wet, cool spring of 1983 slowed wheat development and conditions were favorable for the damaging leaf diseases on susceptible varieties. Speckled leaf blotch was the most damaging. Powdery mildew was present early in the spring, but it did not cause severe yield losses. High nitrogen rated tended to increase the severity of leaf diseases.

Soft wheat varieties, being more resistant to leaf diseases, produced higher grain yield. McNair 1003 had the highest yield, 82 bu/a. Yields of hard wheat varieties were related directly to their resistance to speckled leaf blotch. Pro Brand 830 and Payne yielded 50 bu/a, while other varieties ranged from 12 to 33 bu/a.

Conclusions: After three years of tests, results show that the newer wheat varieties can produce high grain yields without high rates of nitrogen. When wheat is developing rapidly in the spring under cool, wet climatic conditions, high N rates have resulted in a greater incidence of leaf diseases. If the disease organism infects the flag leaf during the reproductive stage of development, grain yields can be severely reduced in susceptible varieties. Results indicate that N rates should not exceed 100 lb/a for the newer semi-dwarf varieties.

Table 3. Selected Wheat Varieties Compared With Three Levels of Nitrogen Fertilizer, Parsons Field, 1983.

	Yield, bu/a				Test wt., lbs/bu				Date headed	Height, in				Lodging, %				Leaf disease rating 1/	
	50	100	150	Avg	50	100	150	Avg		50	100	150	Avg	50	100	150	Avg	Powdery mildew	Septoria leaf spot
	- - lbs N/a - -				- - lbs N/a - -					- - lbs N/a - -				- - lbs N/a - -					
Hard Wheat																			
Newton	26.6	17.4	13.0	19.0	53.7	51.3	50.0	51.7	May 21	42	39	40	40	8	27	58	31	4.0	3.3
Vona	27.8	22.9	23.5	24.7	51.7	51.3	51.3	51.4	May 17	39	40	40	40	63	77	75	72	2.8	3.8
Payne	46.6	54.5	49.3	50.1	57.0	56.7	57.0	56.9	May 21	41	42	42	42	45	35	48	43	4.8	1.5
Pioneer PL145	21.1	10.0	17.4	16.2	52.0	49.7	51.3	51.0	May 20	38	38	39	39	8	47	25	27	4.2	3.5
Tam 105	32.0	32.1	22.3	28.8	52.0	51.7	50.0	51.2	May 20	41	42	42	42	13	23	38	25	3.4	3.0
Agripro Hawk	16.7	9.0	12.1	12.6	51.7	50.0	49.7	50.4	May 20	41	41	42	41	45	85	87	72	3.1	4.8
Agripro Wings	36.1	22.8	20.2	26.4	54.0	53.0	52.0	53.0	May 17	39	38	42	40	73	80	82	78	3.1	3.8
Arkan	33.8	33.2	32.2	33.1	54.7	54.0	55.3	54.7	May 15	36	39	39	38	52	72	57	60	2.8	2.1
Pro Brand 830	58.5	47.3	45.1	50.3	60.0	57.3	57.7	58.3	May 21	40	41	41	41	7	52	47	35	4.7	1.3
Parker 76	16.3	20.4	11.8	16.2	55.0	54.0	53.3	54.1	May 20	42	43	44	43	50	50	57	52	4.6	3.6
Soft Wheat																			
McNair 1003	88.1	80.1	77.4	81.9	56.3	54.7	54.3	55.1	May 18	43	41	40	42	5	13	18	12	1.2	1.0
Pioneer 2553	71.5	54.4	53.6	59.8	57.7	54.3	56.0	56.0	May 18	40	40	41	40	5	7	7	6	2.4	1.3
AVG	39.6	33.7	31.5		54.6	53.2	53.2			40	40	41		31	47	50			

	3-yr avg (81-83) Yield, bu/a				3-yr avg (81-83) Grain protein, %			
	50	100	150	Avg	50	100	150	Avg
	- - lbs N/a - - -				- - lbs N/a - -			
Hard Wheat								
Newton	42.7	39.8	36.4	39.7	13.8	14.3	14.9	14.3
Vona	45.3	42.6	42.7	43.5	13.9	14.1	14.2	14.1
Payne	45.2	47.0	42.7	44.9	13.4	14.0	14.0	13.8
Pioneer PL145	41.7	40.2	39.0	40.3	13.9	14.9	14.9	14.6
Parker 76	39.5	40.1	37.8	39.2	14.5	14.5	14.9	14.6
Soft Wheat								
McNair 1003	74.5	71.5	69.6	71.9	12.0	12.8	13.7	12.8
Pioneer 2553	62.9	56.0	53.3	57.4	13.0	14.5	14.3	13.9
AVG	50.3	48.2	45.9		13.5	14.2	14.4	

LSD COMPARISONS: (1983)

Grain Yield
- Among nitrogen means = 3.3 bu
- Among variety means = 6.8 bu
- N rate x variety = N.S.

Test Weight
- Among nitrogen means = 1.8 lbs/bu
- Among variety means = 1.2 lbs/bu
- N rate x variety = N.S.

Height
- Among nitrogen means = 0.5 inch
- Among variety means = 0.5 inch
- N rate x variety = N.S.

Lodging
- Among nitrogen means = 24.8%
- Among variety means = 16.6%
- N rate x variety = N.S.

1/ Leaf disease rating:
1 = Good resistance
5 = Poor resistance

Effects of N and P Rates and Methods of Application for Winter Wheat

Many of the soils in southeast Kansas test low to medium in available phosphorus, so the method of fertilizer application can affect the efficiency of applied P.

Procedure: This study compared methods and rates of P application for winter wheat. Phosphorus rates were 30, 60, and 90 lbs/a P_2O_5. Methods of P application were dual-knifing (simultaneously injecting NH_3 and 10-34-0 eight inches deep on 15-inch centers), broadcast, and banding with a drill. During 1980- 82 the study was established on an area that tested very low in available P. In 1983 the study was on a site that tested high in soil P.

Results: Wheat yields in 1983 were severely depressed as a result of plant leaf diseases in the spring. Nitrogen also seemed to promote a higher incidence of foliar leaf diseases (powdery mildew and speckled leaf blotch) which increased lodging and subsequent reduction in grain yields. The unfertilized plots yielded nearly double the fertilized treatments. P responses were minimal on this high-testing P soil in 1983.

Conclusions: Previous data from 1980-82 on a low-testing P soil showed that banding the P near the seed resulted in more efficient use of the applied fertilizer. Comparisons between broadcasting and knifing the P were nearly the same over the 3-year period. 1983 was unusual in that high fertility rates reduced grain yields, an effect directly correlated with a high level of speckled leaf blotch when the wheat plant was in the reproductive stage of development. When the flag leaf becomes damaged from plant disease organisms, as in 1983, grain yields and quality are severely affected.

Table 4. Effects of Phosphorus Rates and Method of Application on Wheat Yields, Parsons, 1983.

Fertilizer, lb/a N	P_2O_5	K_2O	Phosphorus application method	1983 1/ Wheat yield bu/a	1980-82 2/ Wheat yield bu/a
0	0	100	- - -	59*	13
80	0	100	- - -	25	15
80	30	100	Dual-Knife	44	31
80	60	100	"	34	45
80	90	100	"	43	48
80	30	100	Broadcast	37	35
80	60	100	"	34	42
80	90	100	"	42	44
80	30	100	Band	29	44
80	60	100	"	32	50
80	90	100	"	34	52
Treatment LSD .05				10	--
Means:					
P_2O_5 rate, lbs/a					
30				37	37
60				34	46
90				40	48
LSD .05				N.S.	--
P application method					
Dual-Knife				41	41
Broadcast				38	40
Band				32	48
			LSD .05	6	--

1/ Initial soil test level was 64 lbs/a of available P (high level).

2/ Initial soil test level was 4 lbs/a of available P. (very low level).

* Check plots without N did not have any lodging problems which were correlated with high levels of speckled leaf blotch.

Effect of Metribuzin on Controlling Cheatgrass in Winter Wheat

Cheatgrass and downy bromegrass are two winter annual weeds that often invade wheat fields, especially where wheat follows wheat in the cropping sequence. Rotating to another crop or applying metribuzin (Sencor and/or Lexone) are the recommended methods of controlling problem cheatgrass in wheat.

Procedure: In early March of 1983, Sencor DF was applied to Newton wheat in Labette county, where a heavy infestation of cheatgrass occurred. Three rates were compared - 0.33, 0.50, and 0.67 lbs/a of Sencor 75 DF.

Results: Two inches of rainfall shortly after the herbicide was applied helped in getting the chemical into the root zone for quick absorption. The higher rate of Sencor (0.67 lb/a) gave excellent control (98%), the medium rate (0.50 lb/a) gave good control (85%), and the low rate (0.25 lb/a) gave poor control (60%) of cheatgrass. There were no noticeable crop injury effects in 1983.

Conclusion: Results from 1981-83 indicate that metribuzin can be effective in controlling cheatgrass in winter wheat, but the maximum rate of application (0.50 to 0.67 lb/a of Sencor and/or Lexone 75 DF) normally is needed in early spring for good control. Slightly lower rates have given good control in late fall when cheatgrass is smaller, provided that the wheat is big enough for application (minimum of three tillers with secondary roots at least two inches in length). When early spring applications are made, wheat should be out of winter dormancy. Rainfall must occur within two weeks of application for effective control. Currently, metribuzin application is restricted to Newton, Tam-105, Tam-W101, and Eagle varieties.

Grain Sorghum Hybrids Compared

Grain sorghum performance trials are designed to evaluate hybrids from private seed companies for grain yield and overall performance under southeastern Kansas climatic conditions.

Procedure: In 1983, seventy-one hybrids were compared at the Parsons field under dryland conditions. Hybrids were planted in 30-inch rows on June 8. Plots were hand thinned to 30,000 plants per acre. Fertilization rate was 125 lbs N, 75 lbs P_2O_5, and 75 lbs K_2O per acre.

Results: Drought conditions during July, August, and early September, as well as high daytime temperatures during blooming and grain formation, were detrimental to grain sorghum yields in 1983. Average yield for all hybrids was only 42 bushels per acre, with a range in yields from 31 to 52 bushels per acre.

Conclusions: Complete results of grain sorghum yields for Kansas in 1983 are compiled in Agric. Expt. Station Report of Progress No. 445.

Effect of Planting Date on Grain Sorghum Production - Early, Medium, and Late Maturing Hybrids

Grain sorghum is planted from late April through late June in southeastern Kansas. More information is needed, however, to determine the optimum planting date for hybrids of a specific maturity.

Procedure: In 1983, 10 grain sorghum hybrids, representing early, medium, medium-late, and late maturity, were planted in 30-inch rows on June 7, June 17, and July 7. Plant population was hand-thinned to 30,000 plants per acre. Wet weather in early spring prevented any early planting dates.

Results: In general there were more yield variations among hybrids than between maturity groupings. Drought conditions during July, August, and early September severely reduced yields. Hot, dry winds during late August also caused considerable damage to hybrids that were blooming then. A late killing frost in 1983 (November 16) allowed the late maturity hybrids that were planted July 7 to reach physiological maturity.

Conclusions: Several different hybrids of varying maturity have been evaluated over planting dates ranging from late April through early July for the past five years (1979-83). Results have been highly variable throughout this period because of environmental conditions. Several planting dates within a given year were not possible because of wet soil conditions. Extreme drought conditions in 1980 and 1983, as well as dry conditions in late summer of 1981 and 1982, also severely reduced yields.

In summary, results indicated that early, medium, and medium-late hybrids can be planted over a wide range of dates and still produce fair yields even under adversely dry conditions. Medium and medium-late hybrids generally produced higher yields than earlier maturing hybrids. Late April and late June tended to be the optimum planting dates for all hybrids, regardless of maturity range. However, when rainfall occurred during the critical period of head emergence, blooming, and grain formation, the influence of planting date on grain yields was not significant.

Table 5. Early, Medium, and Late Season Grain Sorghum Hybrids Compared at Three Different Planting Dates, Parsons, 1983.

Hybrid	Planting date	Yield bu/a	Test wt. lbs/bu	Ht. in.	Lodging %	Date 1/2 bloom	Harvest date	Harvest $\%H_2O$
Pioneer 8790 (early)								
	June 7	65.4	56.7	35	2	7/30	9/7	17.9
	June 17	52.8	59.3	33	3	8/9	9/27	19.7
	July 7	52.3	58.3	34	1	8/23	10/13	23.1
DeKalb B-38 (early)								
	June 7	61.4	55.7	36	3	7/28	9/7	17.9
	June 17	51.6	58.3	34	4	8/8	9/27	20.1
	July 7	48.8	57.7	34	2	8/22	11/3	17.9
Pioneer 8585 (medium)								
	June 7	60.0	56.7	36	4	8/1	9/7	17.7
	June 17	57.5	58.3	36	6	8/14	9/27	21.0
	July 7	44.1	56.7	38	4	8/29	11/3	20.7
DeKalb-46 (medium)								
	June 7	56.1	59.3	38	2	8/6	9/27	18.4
	June 17	53.2	60.0	34	3	8/16	10/13	18.1
	July 7	43.3	55.7	38	2	8/29	11/3	23.6
NC+ 174 (medium)								
	June 7	60.8	59.3	37	1	8/8	9/27	19.4
	June 17	48.3	58.3	34	2	8/19	10/13	19.1
	July 7	52.2	57.3	38	1	9/1	11/3	24.2
Stauffer 734 (medium)								
	June 7	58.7	60.0	35	2	8/1	9/27	17.2
	June 17	60.3	62.0	31	2	8/15	10/13	17.8
	July 7	59.7	57.7	34	1	8/26	11/3	19.5
Pioneer 8272 (medium-late)								
	June 7	58.1	57.7	35	1	8/5	9/27	20.4
	June 17	53.6	59.3	32	2	8/17	10/13	19.2
	July 7	58.6	56.7	34	1	8/28	11/3	21.1
DeKalb - 59 (medium-late)								
	June 7	46.7	57.0	37	1	8/11	9/27	21.6
	June 17	37.3	56.7	34	2	8/20	10/13	20.5
	July 7	62.3	56.3	38	2	9/4	11/18	22.1
Asgrow Colt (late)								
	June 7	66.7	59.0	37	2	8/9	9/27	20.5
	June 17	42.6	54.7	32	1	8/25	11/3	21.1
	July 7	59.9	58.0	39	2	9/6	11/18	23.8
DeKalb-Exp (late)								
	June 7	73.4	60.0	38	2	8/9	10/13	16.3
	June 17	43.9	55.7	32	3	8/25	11/3	20.1
	July 7	48.8	56.7	39	2	9/7	11/18	29.9

LSD values (Yield):

Planting date = N.S.

Planting date x hybrid: Comparing hybrids at same planting date = 1.51
Comparing any hybrid at any planting date = 1.79

Selected Grain Sorghum Hybrids Compared in Wide and Narrow Rows

Planting grain sorghum in narrower rows at higher plant populations has been advocated as one method of increasing yields. It is known that certain hybrids respond differently in narrow rows than others. But this practice has not been fully investigated under the varying climatic conditions of southeast Kansas.

Procedure: As a preliminary study in 1983, selected grain sorghum hybrids were planted in 30-inch and 10-inch rows at one site and only in 7-inch rows at another site. Wide rows were seeded at 45,000 seeds per acre and narrow rows were seeded at 100,000 seeds per acre. Final plant populations were approximately 30,000 plants for the wide rows and 60,000 plants for the narrow row. The grain sorghum was planted June 10. Monthly rainfall totals (inches) for the growing season were June = 5.10, July = 0.72, August = 1.53, and September = 2.23.

Results: An unusually dry summer and high daytime temperatures during July, August, and early September of 1983 were the major factors that led to poor grain sorghum yields at one site and only fair yields at the second plot site.

Hybrids planted in narrow rows were more severely drought stressed than those planted in wider rows. This was very evident at the bloom stage of development because hybrids planted in narrow rows were delayed in maturity and had a difficult time heading under the drought conditions of 1983.

There was considerable variation in yield among hybrids and between replications. However, certain hybrids showed better drought tolerance than others. Results are shown in Table 6.

Conclusions: Under the drought conditions experienced in the summer of 1983, narrow-row grain sorghum yields were severely depressed. But, results are inconclusive at this time, since additional data is needed under more normal growing conditions.

Table 6. Selected Grain Sorghum Hybrids Compared in Wide and Narrow Rows, Parsons Field, 1983.

	Yield, bu/a		Test wt., lbs/bu		Date 1/2 bloom	
Hybrid	30" row	10" row	30" row	10" row	30" row	10" row
DeKalb - 42Y	36.6	29.1	60	58	8/1	8/7
DeKalb - 46	32.7	26.1	59	58	8/5	8/10
Triumph-two 64YG	32.6	31.4	60	59	8/1	8/4
NC+ 172	31.8	24.7	61	58	8/2	8/5
NC+ 174	30.8	17.5	57	56	8/7	8/16
Stauffer 734	30.4	32.0	60	58	8/2	8/5
Pioneer 8585	28.9	33.3	59	59	8/1	8/3
Triumph-two 80D	26.5	12.2	57	56	8/10	8/18
Pioneer 8515	25.1	30.6	60	59	8/1	8/2
Farm Bureau 601	24.8	22.2	58	56	8/7	8/12
Treatment LSD .05	10.8		1		- -	- -

Hybrid (7-inch row spacing)	Yield, bu/a	Test wt., lbs/bu.
Funk's G550	68.0	59
DeKalb 46	66.9	58
Triumph-two 80D	64.4	59
Farm Bureau 601	63.8	56
Stauffer 734	60.0	58
Triumph-two 64YG	59.0	59
Golden Harvest 510	55.4	59
Pioneer 8272	54.6	56
Pioneer 8515	53.4	60
Pioneer 8585	52.3	58
Treatment LSD .05	10.0	1

Planted: June 10, 1983 Harvested: September 20, 1983

Plant population: Narrow rows - 60,000 plants per acre
Wide rows - 30,000 plants per acre

Effects of Cropping Sequence on Soybean Yields

Soybeans are the major cash crop for many farmers in southeastern Kansas. Typically, they are grown in several cropping sequences with wheat and grain sorghum, or in a doublecropping rotation with wheat. More information is needed to determine the agronomic effects of cropping sequences on soybean yields.

Procedure: In 1979 four cropping rotations were initiated at the Columbus field: (1) Wheat - doublecrop soybeans - soybeans, (2) wheat - fallow - soybeans, (3) grain sorghum - soybeans, and (4) continuous soybeans. Essex variety of soybeans was used in all cropping rotations. Fertilizer was applied only to the wheat or grain sorghum crop, with the exception of continuous soybeans, which were fertilized annually.

Results: Five year results are shown in Table 7. In 1983 doublecrop soybeans after wheat produced 23 bushels per acre, while full season soybeans yielded only 19 bushels per acre. Full season soybeans were damaged severely from charcoal rot disease, while the doublecrop soybeans matured later and escaped the disease problem. Continuous soybeans have yielded consistently lower than soybeans following another crop in the rotation.

Conclusions: Preliminary results show the need to rotate soybeans in the cropping sequence. A separate study at the Parsons field has been initiated to determine the agronomic effects of continuous double-cropping soybeans after wheat, but results are inconclusive at this time.

Table 7. Effects of Cropping Sequence on Soybean Yield, Columbus Field.

Cropping sequence	Fertilizer $N-P_2O_5-K_2O$	Yield: 3-yr avg. (79-81-83)	Yield: Full-season soy (80)	Yield: Full-season soy (82)	Soil test 2/: pH	Soil test 2/: Avail P	Soil test 2/: Exch K
	- - lbs/a - -	- - - - - bu/a	- - - - - -				- lbs/a -
Wheat - Doublecrop	80-80-80	52.4					
soybean		18.6			7.1	39	150
Soybean			12.6	28.0			
Grain sorghum -	120-80-80	95.2			7.1	45	150
Soybean			13.3	30.4			
Wheat -	80-80-80	52.7			7.2	42	133
Soybean			12.8	31.9			
Soybean (continuous)	0-40-40	28.0	10.3	27.2	7.3	40	127
LSD .05			1.0	3.0			

1/ Fertilizer applied only to wheat or grain sorghum except for continuous soybeans which received a yearly application of phosphorus and potassium.

2/ Soil samples taken after the fall harvest in 1983.

Wheat and Soybean Yields Compared in a Long-term Fertility and Cropping Rotation

Wheat and soybeans are the major cash crops in much of southeast Kansas. Doublecropping soybeans after wheat, as well as growing three crops in 2 years (wheat-doublecrop soybeans-full season soybeans) is a common practice. Fertility requirements for wheat and soybeans in these systems have not been fully determined over a long period.

Procedure: The current cropping rotation consists of growing three crops in 2 years - (wheat-doublecrop soybeans-full season soybeans). All of the fertilizer is applied to the wheat crop at various rates. Manure is applied every 2 years before full season soybeans are grown. Lime is applied as needed to keep soil pH near 6.8.

Results: The highest wheat and soybean yields are from the plots that have received a balanced fertility program (Table 8). As of this date, the higher fertility rates of P and K have not increased grain yields over the lower level of 50 lbs/a.

Conclusions: Where cropland in southeastern Kansas is intensively farmed, such as growing three crops in two years, soil fertility levels should be monitored closely in order to maintain adequate nutrition for the growing crops.

Table 8. Wheat and Soybean Yields Compared in a Long-Term Fertility and Cropping Rotation, Columbus Field.

Fertility treatments 1/	1983 Wheat Yield	1983 Wheat Test wt.	1981-83 Yield	Soil test pH	Soil test Avail P	Soil test Exch K
	bu/a	lbs/bu	bu/a		- - lbs/a -	
Lime	8	52	11	7.2	8	90
Lime + 75 P_2O_5	25	55	30	7.4	29	85
Lime + 50 P_2O_5 + 50 K_2O	39	58	44	7.3	30	150
Lime + 75 P_2O_5 + 75 K_2O	37	58	43	7.3	29	155
Lime + 100 P_2O_5 + 100 K_2O	39	58	44	7.5	26	120
Lime + manure	39	59	43	7.5	20	140
Lime + manure + 75 P_2O_5	44	57	47	7.4	64	140
Lime + manure + 75 P_2O_5 + 75 K_2O	45	56	47	7.4	42	180
No lime or fertilizer	16	52	10	5.6	7	70

1/ All plots received 75 lbs/a of N.

Fertility treatments 1/	1983 Soybean yield After wheat	1983 Soybean yield Full-season	1982-83 Soybean yield Full-season	Soil test pH	Soil test Avail P	Soil test Exch K
	- - bu/a - -		bu/a		- - lbs/a - -	
Lime	14.5	10.8	18.4	7.1	7	95
Lime + 75 P_2O_5	18.9	13.7	21.4	7.3	25	90
Lime + 50 P_2O_5 + 50 K_2O	23.8	14.3	23.7	7.3	26	135
Lime + 75 P_2O_5 + 75 K_2O	23.6	14.3	23.1	7.3	26	145
Lime + 100 P_2O_5 + 100 K_2O	27.9	15.0	24.5	7.3	25	130
Lime + manure	24.4	13.4	23.7	7.5	31	180
Lime + manure + 75 P_2O_5	23.2	17.4	26.2	7.4	78	185
Lime + manure + 75 P_2O_5 + 75 K_2O	30.2	22.1	32.1	7.3	49	185
No lime or fertilizer	3.5	8.7	11.9	5.6	8	80

1/ Fertilizer applied to wheat crop preceeding soybeans.

Comparison of Tillage Method for Doublecrop Soybeans After Wheat

Producers in southeastern Kansas typically grow doublecrop soybeans after wheat, where soil moisture and time permit. Various tillage methods are used, depending to some degree on the type of equipment that is available. The primary goal is to plant soybeans as quickly as possible after wheat harvest and to produce acceptable yields as economically as possible.

Procedure: Four tillage methods were compared for doublecrop soybeans after wheat harvest at the Columbus field in 1983. Tillage methods were (1) plow under stubble, (2) disc stubble, (3) burn stubble and then disc, and (4) plant no-till in stubble. Crawford soybeans were planted with a JD 7000 planter on July 11 in 30-inch rows. All plots received 1 qt/a of Surflan and 0.33 lbs/a of Lexone 75 DF. No-till plots also received 1 qt/a of Round-up. Soil moisture samples at the 2-to 8-inch depth were taken at the bloom stage and at early pod fill.

Results: Despite the summer drought conditions that occurred in 1983, yields averaged 20 to 25 bushels per acre. There were no significant differences in yield between the plow, burn, or disc method of tillage. Planting no-till gave the lowest yield.

Soil moisture levels (2-to 8-inch depth) at the bloom stage and at early pod fill were nearly the same for all tillage methods.

Weed control, as well as soybean emergence, was satisfactory for all tillage methods.

Conclusion: More data is needed before valid conclusions are made regarding the most efficient tillage method for planting doublecrop soybeans. Additional chemical costs and lower yield potential with the no-till method of planting have to be evaluated against higher equipment costs and higher yields with reduced or conventional tillage methods. Long-term effects of burning the stubble every two years also has to be considered.

Table 9. Comparison of Tillage Methods for Doublecrop Soybeans, Columbus Field, 1983.

Tillage method	Yield, bu/a 1983	Yield, bu/a 1982	Soil moisture, % Bloom stage	Soil moisture, % Early pod fill
Plow, disc, field cult., plant	25.2	26.1	13.86	11.56
Burn, disc, field cult., plant	24.2	25.8	14.97	10.74
Disc (2X), plant	23.2	26.6	14.94	10.57
Plant No-till	20.5	26.3	15.68	11.73
LSD .05	3.6	N.S.	N.S.	N.S.

Comparison of Soybean Herbicide Performance

Several different herbicide options are available for soybean producers to control weeds commonly found in the soybean fields of southeastern Kansas. The specific weed species that are present in the field, as well as the preference for application method, determines the herbicide product that is best suited for a particular field.

Procedure: Commonly labelled herbicide products for soybeans were evaluated at the Columbus field in 1983 for the control of several different weed species (large crabgrass, smooth pigweed, and cocklebur). On one test site, crabgrass and pigweed were the predominant weeds, so preplant and preemerge herbicides were compared. Treatments applied 1 week before planting were incorporated with a smaller disc equipped with 20-inch blades and 7 1/2-inch spacing between blades. Prior to planting, a second pass was made with a field cultivator and mulcher. The shallow incorporated treatments of Dual and Lasso were mixed in the soil with the field cultivator. On the other plot area, cockleburs were the major competitior, so postemerge broadleaf herbicides were compared. Postemerge treatments were applied about 3 weeks after planting when cockleburs were 2 to 6 inches tall.

Results: Where the preplant incorporated and preemerge herbicides were compared, the herbicides applied after planting gave the best weed control in 1983 (Table 10). Rainfall within one week of planting provided good activation for the surface-applied herbicides. Dual gave slightly better grass control than Lasso or Surflan. There was no significant difference in pigweed control between Lexone (Sencor) and Lorox. Among the preplant incorporated grass herbicides (Treflan, Prowl, Basalin), there were no apparent differences in weed control, although they did not provide as good grass control as the preemerge treatments.

At the site where cockleburs were present, Basagran treatments were compared with either 2,4-DB, nonionic surfactant, vegetable oil, or crop oil (Table 11). The addition of oil treatments or a small amount of 2,4-DB (two to four ounces), improved Basagran's performance on cockleburs under the dry conditions of 1983. On treatments where Blazer was tankmixed with Basagran, cocklebur control was not improved over Basagran alone, although crop injury was more severe. Yields, however, were not reduced as a result of this injury.

Conclusion: The most important criteria in selecting a soybean herbicide are the weed species that are present in the field. Most annual grasses and small-seeded, broadleaf weeds can be controlled adequately with preplant or preemerge herbicides. Climatic conditions often determine which application method (preplant versus preemerge) is the most successful in controlling weeds in any given year. However, the depth of herbicide incorporation can be a major factor. If herbicides are incorporated too deeply, the chemical barrier becomes diluted and poor weed control results.

Where large-seeded broadleaf weeds, such as cocklebur, are the problem, postemerge applications of Basagran with the addition of a surfactant or crop oil are the best option. With these postemerge applications, it is vitally important that the weeds are small and actively growing at the time of spraying. If pigweeds escape preplant or preemerge herbicides, then Blazer can be used successfully. Certain species of morningglory also can be controlled with Blazer, but the ivy-leaf species is more resistant and control is often poor.

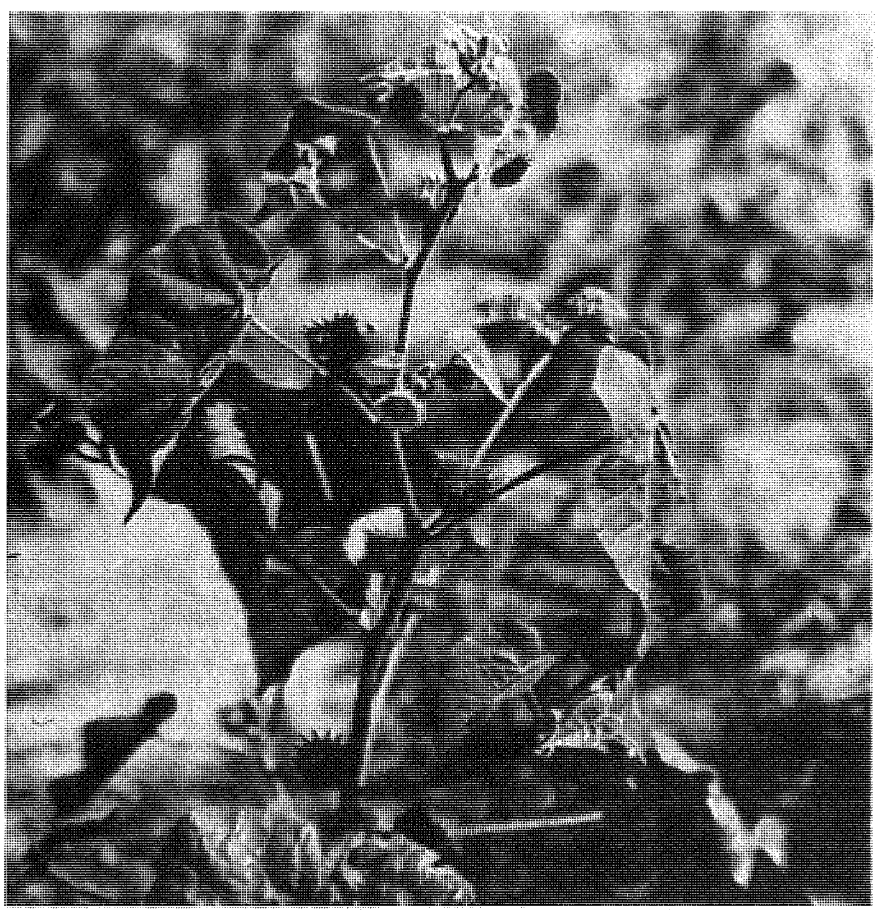

Table 10. Comparisons of Soybean Herbicides for Weed Control, Columbus Field, 1983.

Herbicide treatment	Rate lbs. a.i./a	How applied 1/	Weed control, % 2/ Grass	Brlf.	Yield bu/a
Treflan + Lexone	.75 + .38	PPI	80	75	11.3
Prowl + Lexone	1.00 + .38	PPI	83	83	11.1
Basalin + Lexone	.75 + .38	PPI	80	77	11.0
Lasso + Lexone	2.00 + .38	Shallow PPI	68	73	7.7
Dual + Lexone	1.50 + .38	Shallow PPI	82	83	6.8
Lasso + Lexone	2.00 + .25	Pre	90	93	14.0
Dual + Lexone	1.50 + .25	Pre	98	97	14.0
Surflan + Lexone	0.75 + .25	Pre	93	93	13.4
Lasso + Lorox	2.00 + .5	Pre	93	94	11.0
Dual + Lorox	1.50 + .5	Pre	96	97	9.8
Surflan + Lorox	0.75 + .5	Pre	92	95	9.3
No herbicide	- -	- -	0	0	5.5
Treatment LSD .05			6	8	3.1

1/ Application dates:

PPI (Preplant Incorporated) = June 13
Pre (After planting and before crop emergence) = June 20

2/ Grass weeds were large crabgrass.
Broadleaf weeds consisted of smooth pigweed, common ragweed, and morningglory.

Table 11. Evaluation of Postemerge Soybean Herbicides for Control of Cocklebur, Columbus Field, 1983.

Herbicide treatment 1/	Rate a.i./a	Cocklebur 2/ control, %	Yield bu/a	Crop injury
Basagran	0.5	82	14.3	1.4
Basagran + 2,4-DB	0.5 + 4 oz	90	15.7	1.5
Basagran + AG-98 Surf.	0.5 + .25%	85	15.2	2.0
Basagran + Veg. oil	0.5 + 1%	90	14.8	2.5
Basagran + Crop oil	0.5 + 1%	90	15.9	2.5
Basagran	0.75	86	14.0	1.5
Basagran + AG-98 Surf.	0.75 + .12%	88	16.2	2.0
Blazer	0.5	40	7.0	1.8
Blazer + AG-98 Surf.	0.5 + .12%	43	7.7	2.0
Blazer + 2,4-DB	0.5 + 2 oz	60	11.1	2.0
Blazer + Basagran + AG-98 Surf.	0.25 + 0.5 + .12%	86	15.3	3.0
Blazer + Basagran + AG-98 Surf.	0.5 + 0.5 + .12%	88	14.5	3.0
Blazer + Basagran + AG-98 Surf.	0.5 + 0.75 + .12%	88	16.0	3.5
No herbicide		0	2.9	
Treatment LSD .05		8	3.7	0.2

1/ Herbicides applied July 19.

2/ Cockleburs were 2" to 6" in height at time of spraying.

Comparisons of Date and Rate of Metribuzin Herbicide for Velvetleaf Control in Soybeans on Light Textured Soils

Broadleaf weeds, such as velvetleaf, are a problem in many soybean fields of southeastern Kansas. On light-textured, silt loam soils with less than 1.5% organic matter, the application rate of metribuzin herbicide (Sencor/Lexone) is critical in order to obtain control of broadleaf weeds without causing excessive soybean injury. A split-shot method of metribuzin application (part applied preplant and a second application after planting but before soybean emergence) has been promoted in order to obtain better broadleaf weed control with less injury to the soybean plant.

Procedure: Metribuzin was applied either two weeks prior to planting, immediately before planting, right after planting, or as split-shot application. Application rates were 0.25, 0.38, 0.50, and 0.62 lbs/a of active ingredient (metribuzin). Preplant treatments were incorporated with a light disc (20-inch blades, 7 1/2-inch spacing), since Treflan was applied in the tankmix for grass control. Prior to planting, one pass was made with a field cultivator equipped with a mulcher to provide a level seedbed. The plot area had a silt loam texture with 1 to 1.5% organic matter and heavily invested with velvetleaf.

Results: Weed control and yield results are shown in Table 12. Applying the herbicide immediately prior to or after planting gave better weed control than applying it 2 weeds ahead of planting. The split-shot method of application gave the best overall velvetleaf control with rates of 0.38 + 0.25 or 0.25 + 0.25 lbs/a of metribuzin. A heavy rain one day after planting caused soil crusting problems which reduced soybean emergence, but there were no noticeable herbicide injury effects in 1983.

Conclusion: Where velvetleaf is a major problem in soybean fields, a split-shot application of metribuzin would be beneficial. The major disadvantage to this method of application is going over the field twice with the sprayer, but if the major weed population is concentrated along the borders of the field or in small areas, the whole field would not need to be sprayed the second time.

In 1983 a similar study involving a split-shot method of application was evaluated on a plot area where cocklebursw were the major weed pressure. However, unlike the previous velvetleaf study that was reported, cocklebur control was very poor with any application method or rate of metribuzin.

Table 12. Comparisons of Date and Rate of Metribuzin (Sencor/Lexone) for Control of Velvetleaf in Soybeans on Light-Textured Soils, Columbus Field, 1983.

Metribuzin rate lbs a.i./a	Time of application 1/	Velvetleaf control, %	Yield, bu/a 2/
0.62	2 wks before plant	90	14.0
0.50	2 wks before plant	68	14.7
0.38	2 wks before plant	62	14.2
0.38	before plant	88	14.2
0.25	2 wks before plant	25	10.2
0.25	before plant	70	12.1
.38 + .12 (split)	2 wks before plant + after plant	83	13.2
.38 + .12 (split)	Before plant + after plant	88	13.6
.38 + .25 (split)	2 wks before plant + after plant	91	14.2
.38 + .25 (split)	Before plant + after plant	93	16.8
.25 + .12 (split)	2 wks before plant + after plant	77	12.1
.25 + .12 (split)	Before plant + after plant	82	13.9
.25 + .25 (split)	2 wks before plant + after plant	90	11.1
.25 + .25 (split)	Before plant + after plant	94	13.6
0.38	After plant	70	16.0
0.25	After plant	62	13.2
0	- - -	0	7.1
LSD .05		8	2.4

1/ Application dates:

2 wks before planting = June 13
Immediately before planting = June 28
Planting date = June 28
Immediately after planting = June 28

2/ There were no noticeable herbicide injury effects at the time of soybean emergence.

Effects of Tank-Mixing Postemergent Soybean Herbicides

The use of postemerge herbicides seems to have increased among soybean producers in recent years, partly because of newer products that are available and also because of an increased acreage of narrow row soybeans. Research findings are incomplete at this time as to the best method of applying the grass and broadleaf herbicides in a total postemergent program.

Procedure: Two herbicide studies were evaluated at the Columbus field in 1983 to determine the effects of tank-mixing two or more postemergent soybean herbicides together or applying one herbicide sequentially, 5 to 7 days afterthe first postemerge application. The addition of a crop oil or surfactant also was evaluated with the different methods of application. Broadleaf herbicides included Basagran, Blazer, and Tackle. Blazer and Tackle are marketed by different companies, but contain the same active ingredient (acifluorfen). Grass herbicides included Fusilade, Poast, and Dow 453 (experimental).

The major weed competitors at both sites were large crabgrass and smooth pigweed, which were six inches tall or less at the time of spraying. Herbicides were applied approximately 3 weeks after soybeans were planted. Crop injury notes were taken 5 to 7 days after spraying. Herbicide treatments were applied in mid-morning. Maximum afternoon temperature was near 100° F, and relative humidity was 40 to 50 percent. The soil condition was slightly moist.

Results: Research findings in 1983 (Table 13 & 14) indicate that when two or more postemerge herbicides are applied as tank-mixes, the weed control of the grass herbicide is reduced considerably in some cases, while the performance of the broadleaf herbicide is no different than when applied separately.

This antagonistic relationship seemed to be more pronounced with the grass herbicide Poast than with the experimental herbicide DOW 453.[1/]

Control of annual grasses was significantly better where crop oil was added at one percent of the spray solution than where a non-ionic surfactant was used. The addition of the crop oil caused slightly more crop injury to the soybean plant, but yields did not seem to be affected by the spray injury.

Conclusion: Current data indicate that if a producer is considering a total postemerge herbicide program, the grass and broadleaf herbicides that are currently available should be applied sequentially rather than as a tank-mix, or the rate of the grass herbicide should be increased when the broadleaf and grass herbicides are tank-mixed.

[1/] DOW 453 has been named Verdict and will be under an Experimental Use Permit in 1984.

Table 13. Comparisons of Postemerge Herbicide Application Methods in Soybeans, Columbus Field, 1983.

Herbicide treatment	Application method 1/	Rate a.i./a	Weed control, % Crab-grass	Pig-weed	Yield bu/a	Crop injury 2/
Fusilade + Crop oil	Sequential	.25 + 1%	77	80	10.2	2.0
Blazer + AG-98		.38 + .25%				
Fusilade + Blazer + Crop oil	Tank-mix	.25 + .38 + 1%	75	95	11.6	3.0
Fusilade + Blazer + Ag-98	Tank-mix	.25 + .38 + .25%	70	95	9.2	2.5
Poast + Crop oil	Sequential	.20 + 1%	97	70	10.3	2.0
Blazer + AG-98		.38 + .25%				
Poast + Blazer + Crop oil	Tank-mix	.20 + .38 + 1%	87	94	11.1	3.0
Poast + Blazer + Ag-98	Tank-mix	.20 + .38 + .25%	70	95	9.3	2.0
Dow 453 + Crop oil	Sequential	.25 + 1%	98	87	16.0	2.0
Blazer + AG-98		.38 + .25%				
Dow 453 + Blazer + Crop oil	Tank-mix	.25 + .38 + 1%	94	96	13.6	3.0
Dow 453 + Blazer + AG-98	Tank-mix	.25 + .38 + .25%	85	96	12.0	2.0
No herbicide	- - -	- - -	0	0	1.8	0
Treatment LSD .05			6	8	3.5	0.5

1/ Application dates: July 19 and July 25.

2/ Crop injury: 1 = no injury, 5 = plants dead.

Table 14. Comparisons of Postemerge Herbicide Application Methods in Soybeans, Columbus Field, 1983.

Herbicide treatment	Application method [1]	Rate a.i./a	Weed control, % Crab grass	Pig-weed	Crop injury [2]
Tackle + Basagran + AG-98		.25 + .50 + .25%	78	95	2.0
Fusilade + Crop oil	Sequential	.25 + 1%			
Tackle + Basagran +		.25 + .50	68	95	3.5
Fusilade + Crop oil	Tank-mix	.25 + 1%			
Tackle + Basagran +		.25 + .50	53	95	2.0
Fusilade + AG-98	Tank-mix	.25 + .25%			
Tackle + Basagran + AG-98		.25 + .50 + .25%	92	95	2.0
Poast + Crop oil	Sequential	.20 + 1%			
Tackle + Basagran		.25 + .50	67	95	2.5
Poast + Crop oil	Tank-mix	.20 + 1%			
Tackle + Basagran		.25 + .50	40	95	2.0
Poast + AG-98	Tank-mix	.20 + .25%			
Tackle + Basagran + AG-98		.25 + .50 + .25%	95	95	2.0
Dow 453 + Crop oil	Sequential	2 oz + 1%			
Tackle + Basagran		.25 + .50	90	95	2.5
Dow 453 + Crop oil	Tank-mix	2 oz + 1%			
Tackle + Basagran		.25 + .50	78	95	2.0
Dow 453 + AG-98	Tank-mix	2 oz + .25%			
No herbicide	- - - -	- - - -	0	0	0
Treatment LSD .05			10	--	0.4

[1] Application dates: July 14 and July 25.

[2] Crop injury: 1 = no injury, 5 = plants dead.

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D. A. Whitney, research soil chemist, Dept. of Agronomy, KSU, Manhattan

BEEF CATTLE RESEARCH

Lyle W. Lomas

Effect of Ammoniated Fescue Hay on the Performance of Backgrounded Steers[1]

Many tons of marginal to low quality hay are harvested annually in Kansas either by cutting low quality mature forage for hay or because of weather damage to good quality forage between cutting and baling. Supplementation of this forage is necessary to obtain optimum beef cattle performance. Several alternatives are available for protein supplementation of beef cattle consuming marginal and low quality roughages. A recent development has been treatment with anhydrous ammonia to increase the level of crude protein, as well as improve the digestibility of the fibrous fraction of the hay by breaking down the lignin-cellulose bonds. This study evaluated performance of stocker steers fed fescue hay supplemented with protein blocks or treated with anhydrous ammonia.

Procedure: On October 25, 1982, 45 big round bales of fescue hay that had been baled in mid-July of 1982 were placed in a three bale pyramid that was 15 bales long and covered with a 28' x 100' sheet of 6 millimeter black plastic. The plastic was secured and sealed airtight around the base. The nurse tank hose was then placed through the plastic and anhydrous ammonia added at 3.0% of the weight of the hay. The hay remained covered until November 16, 1982, at which time two bales were removed to allow aeration before feeding.

Seventy-two steer calves with an average initial weight of 488 lb were divided equally into four groups of 18 head each on November 23, 1982, and placed on four 5-acre fescue pastures. Steers on two pastures were fed big round bales of late-cut, low quality fescue hay supplemented with 37% protein blocks (16.2% crude protein equivalent from nonprotein nitrogen), while cattle on the other two pastures were fed similar hay harvested at the same time, but treated previously with anhydrous ammonia.

All steers were fed 4 lb of rolled milo per head daily and offered *ad libitum* a salt and mineral mixture and hay fed from round slant bar big bale feeders. Cattle fed untreated hay were fed protein blocks *ad libitum*. All cattle were implanted with Ralgro and wormed on November 23, 1982. Initial and final steer weights were taken following a 16 hour shrink from feed and waters. The study was terminated on March 15, 1983 (112 days).

Results: Results of this study are presented in Table 15. Two steers were removed from the ammoniated hay treatment during the study for reasons unrelated to the experimental treatment. Steers fed ammoniated hay consumed 53.6% more ($P < .05$) hay and gained 31.5% more ($P < .05$) than those fed untreated hay supplemented with protein blocks. The higher levels of intake

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[1] Anhydrous ammonia was provided by U.S.S. Agri-Chemicals, Atlanta, GA.

and gain obtained with the ammonia-treated hay are probably because it is more digestible than the untreated hay. Samples collected to determine actual ammonia recovery were lost in a barn fire at our Mound Valley location in November, 1982. However, samples that were taken as the hay was being fed on March 1, 1983, revealed that the crude protein levels of the untreated and ammonia-treated hay were 8.3% and 12.0%, respectively. All hay was stored outside and even though the ammoniated hay was covered with plastic initially, most of it was uncovered by the end of the study due to wind damage of the plastic. Therefore, the ammoniated hay was well aerated before it was sampled for crude protein on March 1.

Conclusions: Anhydrous ammonia treatment of fescue hay resulted in higher levels of hay consumption and rate of gain by stocker steers when compared to untreated fescue hay supplemented with protein blocks. This method of protein supplementation appears to be an effective means of improving the digestibility of marginal and low quality hay.

Table 15. Effect of Ammoniated Fescue Hay on the Performance of Backgrounded Steers (112 days).

Item	Untreated hay + protein blocks	Ammonia treated hay
No. of steers	36	34
Initial wt, lb	490	486
Final wt, lb	550	565
Total gain, lb	60	79
Average daily gain, lb	.54[a]	.71[b]
Daily hay intake, lb	4.35[a]	6.68[b]
Daily protein block intake, lb	.28	- -

[a,b]Means with different superscripts differ significantly ($P < .05$).

Fescue vs Fescue Interseeded with Red Clover for Backgrounding Heifers

Interseeding of legumes into established stands of cool season grasses, such as tall fescue, has become popular during the past few years. This increased popularity can be attributed to several possible reasons. Legumes fix nitrogen from the air into the soil, thereby reducing nitrogen fertilizer requirements and also improving beef cattle performance. Recent research has shown that legumes interseeded in fescue reduce the toxicity effects caused by the fungus *Epichloe typhina*. The presence of legumes also extends the length of the grazing season further into the summer months. While interseeding of legumes has proven to be successful in other states, limited grazing research has been conducted in Southeast Kansas to determine the value of legumes interseeded in cool season grasses in this area. The following research was conducted to compare performance of cattle grazing tall fescue and tall fescue interseeded with red clover.

Procedure: On October 21, 1982, 72 heifer calves (481 lb) were implanted with Ralgro (R) and allotted randomly to eight 5-acre pastures with nine head per pasture. Four of these pastures contained fescue interseeded with red clover and the other four contained fescue only. Cattle were wintered on these pastures and fed 4 lb of rolled milo per head daily and mixed grass hay *ad libitum* from big round bales.

On April 26, 1983, stocking rates were adjusted to match forage availability. Three heifers were removed from each fescue-red clover pasture and placed on pastures containing only fescue. Each fescue pasture then contained 12 head per pasture and the fescue-red clover pastures contained six head per pasture.

Initial and final weights for both the winter and spring phases were taken following a 16-hour shrink from both feed and water.

Pastures interseeded with red clover received 12 lb of Kenstar red clover per acre on February 20, 1981. An additional 5 lb of seed/acre was applied March 2, 1982. Two tons of ag lime were applied in 1980, followed by fertilization with 40 lb P_2O_5 and 40 lb K_2O/acre. An additional 40 lb K_2O/acre was applied in spring, 1982.

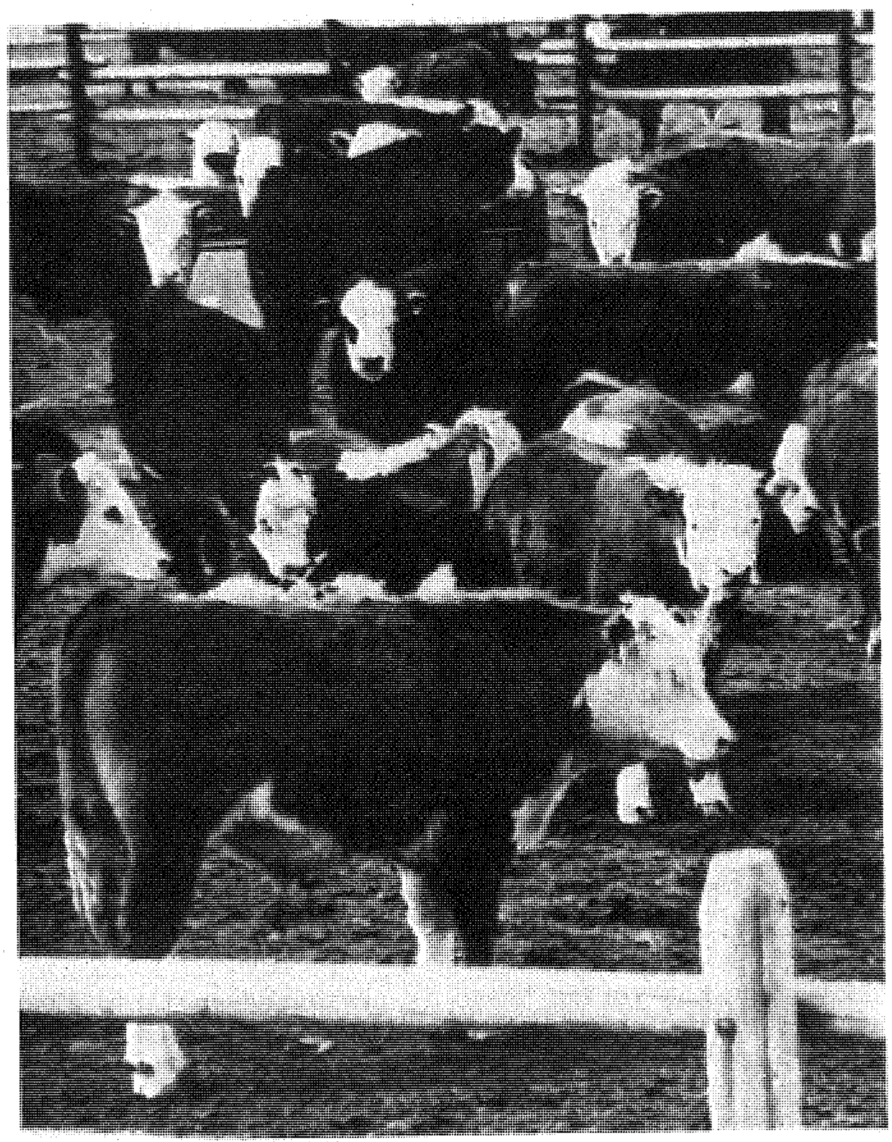
Comparable fescue pastures received 80-40-40 lb of N-P_2O_5-K_2O/acre in 1980, 120-0-40 in springs of 1981 and 1982, 50 lb N/acre on September 3, 1982, and 100 lb N/acre on February 17, 1983.

Results: Performance during the winter phase is presented in Table 16. During this phase, which extended from October 21, 1982 until April 26, 1983, the cattle on fescue gained 14.9% more (20 lb) ($P < .05$) and consumed 30.2% less hay ($P < .01$) than those grazing fescue interseeded with red clover.

Performance during the spring phase is presented in Table 17. During this phase, cattle grazing fescue interseeded with red clover gained 16.8% more (16 lb) ($P < .05$) than those on straight fescue. However, the fescue pastures produced more forage and were stocked at a higher rate, resulting in 67.6% more ($P < .01$) weight gain per acre.

Season-long production on an animal liveweight gain per acre basis is listed in Table 18. Gain per acre was not significantly different during the winter phase but was higher for cattle on straight fescue. Spring phase and season-long production heavily favored the straight fescue over the fescue interseeded with red clover. Beef cattle gain per acre from straight fescue was 34.0% higher (128 lb) ($P < .01$) than fescue interseeded with red clover.

Conclusions: Beef production per acre was higher from pastures in pure stands of fescue when compared to fescue interseeded with red clover. Although cattle performance was superior for fescue interseeded with red clover in the spring and early summer, more forage was available from straight fescue, facilitating a higher stocking rate and thereby producing more total gain per acre. Pastures containing fescue only also produced more fall growth, so less hay was needed for cattle on these pastures during the winter months.



Fescue vs Fescue + Red Clover

Table 16. Winter Phase 10-21-82 to 4-26-83 (187 days)

Item	Fescue	Fescue + Red Clover
No. of heifers	36	36
Initial wt., lb	480	482
Final wt., lb	634	616
Total gain, lb	154[a]	134[b]
Average daily gain, lb	.82[a]	.72[b]
Animal liveweight gain/acre, lb	277	241
Daily hay consumption, lb/head	6.45[c]	9.24[d]

[a,b]Means on the same line with different superscripts differ significantly ($P < .05$)

[c,d]Means on the same line with different superscripts differ significantly ($P < .01$)

Table 17. Spring Phase 4-26-82 to 6-23-83 (58 days)

Item	Fescue	Fescue + Red Clover
No. of heifers	47	24
Initial wt., lb	633	605
Final wt., lb	730	718
Total gain, lb	97[a]	113[b]
Average Daily gain, lb	1.67[a]	1.95[b]
Animal liveweight gain/acre, lb	228[c]	136[d]

[a,b]Means on the same line with different superscripts differ significantly ($P < .05$)

[c,d]Means on the same line with different superscripts differ significantly ($P < .01$)

Table 18. Total Grazing Season Production

Item	Fescue	Fescue + Red Clover
Winter phase gain/acre, lb	277	241
Spring phase gain/acre, lb	228[c]	136[d]
Total gain/acre, lb	505[c]	377[d]

[c,d]Means with different superscripts differ significantly ($P < .01$)

Comparison of Triticale and a Rye-Wheat Mixture as Pasture for Backgrounding Cattle

Wheat and other small grain forages frequently are used as pasture during the late fall and early spring in southeastern Kansas. Wheat is often the crop of choice, especially if the primary objective is grain production. However, if pasture is the main consideration, there may be other small grains that will yield more forage and produce greater beef cattle weight gain per acre than wheat.

Research has been conducted and is still ongoing at the Southeast Kansas Experiment Station to determine which winter annual small grains will result in maximum forage and beef production. An earlier study conducted in 1981-82 revealed that triticale produced nearly twice as much beef liveweight gain per acre as 'Newton' wheat. The following study was conducted to compare triticale and a mixture of rye and wheat with respect to performance of grazing stocker cattle.

Procedure: On August 20, 1982, two 5-acre fields were seeded with winter annuals. One field was seeded with 110 lb of triticale per acre and the other was seeded with 60 lb of Bonel rye and 30 lb of Newton wheat per acre. Prior to seeding, 50 lb per acre of actual N was applied to each field and on September 29, 1982, 25-65-70 lb of N-P_2O_5-K_2O/acre was applied to each pasture. An additional 50 lb of actual N per acre was applied to both pastures on April 18, 1983. Pastures were grazed from November 18 to December 16, 1982 (28 days) and from February 23 to May 31, 1983 (97 days). Pastures were stocked according to availability of forage. All cattle received 5 lb of rolled milo per head daily and were implanted with Ralgro. Cattle were weighed following a 16-hour shrink from feed and water before they were turned out and following removal from the pastures.

Results: Results of this study are listed in Table 19. The rye-wheat mixture produced 3.25 times more beef gain per acre and 2.79 times higher ($P < .01$) average daily gain than the triticale. Since triticale was superior to wheat in an earlier study with respect to beef liveweight gain per acre, it would appear that the rye is largely responsible for the rye-wheat mixture being superior to triticale in this study.

Conclusions: A mixture of 2/3 rye and 1/3 wheat produced higher average daily gain and more liveweight beef gain per acre than triticale.

Table 19. Triticale vs Rye-Wheat for Grazing Stocker Cattle.

Item	Triticale	Rye + Wheat
Liveweight beef gain, lb/acre	153	497
Animal days/acre	153	176
Average daily gain, lb	1.01[a]	2.82[b]

[a,b]Means with different superscripts differ significantly ($P < .01$).

Effect of Energy Supplementation on Performance of Steers Grazing Bermudagrass

Energy supplementation of grazing stocker cattle has become more popular in recent years for several reasons. With high interest rates, energy supplementation increases the rate of gain, thereby reducing the duration of cattle ownership and possibly the total interest bill. Energy supplementation also serves as a vehicle for feeding monensin and other antibiotics that might be beneficial. If cattle are hand-fed on a daily basis, energy supplementation provides the opportunity for better management by making it easier to check the cattle and observe them for possible health problems. Cattle supplemented with energy while on pasture also may go on feed faster when placed in the feedlot.

This study was conducted to evaluate the effect of energy supplementation of stocker cattle grazing bermudagrass.

Procedure: Forty-five thin, mixed yearling steers (518 lb) were allotted randomly by weight and divided into three equal groups of 15 head each on June 9, 1983 and placed on three 5-acre bermudagrass pastures that had been fertilized previously with 125-60-80 lb of N-P_2O_5-K_2O/acre on May 10, 1983. One group of steers received no energy supplementation while the other two groups received 2 or 4 lb of rolled milo plus 200 mg monensin per head daily. Steers were rotated among pastures at 14-day intervals to minimize pasture differences. All steers were implanted with 36 mg of Ralgro at the start of the study. Initial and final weights were taken following a 16-hour shrink from feed and water. This study was terminated on September 29, 1983 (112 days).

Results: Results of this study are presented in Table 20. Steers receiving 2 lb and 4 lb of rolled milo per head daily gained 54.3% (43 lb) ($P < .01$) and 121.4% (97 lb) ($P < .01$) more, respectively, than the unsupplemented control group. Feeding 4 lb of rolled milo produced 43.5% (54 lb)

(P <.01) more gain than feeding 2 lb of grain. Following termination of this study, these steers were placed in the feedlot to determine what effect energy supplementation on pasture would have on subsequent feedlot performance. These results will be reported in a future publication.

Conclusion: Energy supplementation significantly improved gains of stocker steers grazing bermudagrass. Highest gains in this study were obtained with feeding 4 lb of rolled milo per head daily.

Table 20. Energy Supplementation of Steers Grazing Bermudagrass (112 days).

Item	Level of Milo (lb/head/day)		
	0	2	4
No. of steers	15	15	15
Initial wt., lb.	518	519	518
Final wt., lb.	595	639	692
Total gain, lb.	77	120	174
Average daily gain, lb.	$.70^a$	1.08^b	1.55^c

^{a,b,c} Means with different superscripts differ significantly (P <.01).

Implants[1] for Grazing Steers

Growth-promoting implants usually improve gains of growing and finishing cattle by 8 to 15%. This is accomplished by means of slow absorption of the pellets into the bloodstream over a period of 70 to 200 days. The implants are composed of natural hormones or compounds that stimulate the release of growth-promoting hormones in the body. Currently there are four implants approved for use in growing and finishing steers. These include Synovex-S and Steeroid which both contain 20 mg estradiol benzoate and 200 mg progesterone, Ralgro which contains 36 mg zeranol, and Compudose whose active ingredient is 24 mg of estradiol 17β. The effective life of Synovex-S, Steeroid, and Ralgro is thought to be approximately 100 days, while Compudose is supposed to have an effective life of 200 days. Ralgro is the only implant that has a required withdrawal time before slaughter. Cattle implanted with Ralgro must not be implanted within 65 days of slaughter. The following study was conducted to compare the effect of single dose of Synovex-S, Ralgro and Compudose on gains of grazing stocker steers.

Procedure: On April 7, 1983, 64 yearling steers with an initial weight of 574 lb were blocked by weight and allotted equally to the following implant treatments: 1)control - no implant; 2) Synovex-S; 3) Ralgro; 4) Compudose. A single dose of each implant was administered at the start of the study following procedures recommended by the manufacturers. Cattle were implanted once at the beginning of the trial and at no other time was any additional anabolic treatment given. Sixteen steers were allotted to each implant treatment. Two steers on each treatment were placed in each of eight 5-acre smooth bromegrass pastures, resulting in a total of eight steers per pasture. Steers were rotated among pastures at 14-day intervals to minimize pasture differences. Supplemental feed was provided to all cattle in equal amounts when pastures became short. Retention of Compudose implants was checked every 28 days. Initial and final weights were taken following a 16-hour shrink from feed and water. The study was terminated on October 25, 1983 (201 days).

Results: Results of this 201-day grazing study are presented in Table 21. Steers implanted with Ralgro and Compudose gained 13.7% (38 lb) more ($P < .05$) and 9.9% (28 lb) more ($P < .10$), respectively, than nonimplanted controls. Although cattle implanted with Synovex-S gained 5.3% (15 lb) more than controls, this was not a significant difference ($P > .10$). There was no significant difference ($P > .10$) in gain between Synovex-S and Ralgro or Compudose. Gains between Ralgro and Compudose implanted steers were similar ($P > .10$). Two Compudose-implanted steers were removed from the study because they lost their implants and 1 control, 3 Synovex-S and 1 Compudose implanted steers were removed from the study for reasons unrelated to experimental treatment.

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[1] Synovex-S, Ralgro and Compudose implants were provided by Syntex Agribusiness Inc., International Minerals and Chemical Corporation, and Elanco Products Co., respectively.

Conclusions: A single dose of Ralgro and Compudose significantly improved gains of grazing steers in a 201-day grazing study. Implanting with Ralgro resulted in greatest improvement in gains. Steer performance with Synovex-S, Ralgro and Compudose was statistically similar.

Table 21. Effect of Implants on Grazing Steer Performance (201 days).

Item	Control	Synovex-S	Ralgro	Compudose
No. of steers	15	13	16	13
Initial wt., lb	580	576	574	568
Final wt., lb	843	854	875	859
Total gain, lb	263	278	301	291
Average daily gain, lb	1.31[a,c]	1.38	1.49[b,d]	1.44[b]

[a,b]Means with different superscripts differ significantly ($P < .10$).

[c,d]Means with different superscripts differ significantly ($P < .05$).

Effect of Oxytetracycline Hydrochloride Coating Added to Washed Compudose Implants in Pasture Steers[1]

Compudose is a long-term silicone rubber implant that contains estradiol 17β. It has a payout activity that is approximately two times longer than other growth promotants. Previous research has shown that implantation of Compudose results in an overall rate of gain improvement of 9-16% in grazing stocker cattle

Retention of the Compudose implant in the ear has been a problem when the implant was improperly administered. Failure to properly cleanse the implant site and disinfect the implanter needle prior to implantation has resulted in infection developing around the implant. This infection has been found to be the major factor causing loss of implants. Research has shown that cleansing of the implant site, disinfecting the implanter needle and dipping it in a tylosin-neomycin powder prior to implantation are effective in reducing infection and thereby improving retention of Compudose implants. The following study evaluated the effect of adding oxytetracycline

[1] Implants and partial financial assistance provided by Eli Lilly and Co., Indianapolis, Indiana.

hydrochloride antibiotic coating to Compudose on performance of steers grazing brome grass.

Procedure: Eighty-one steers of primarily Angus breeding from a Texas ranch, with an average weight of 551 lb, were divided by weight into three blocks on May 11, 1983. Steers within each block were assigned randomly to one of the following implant treatments: 1) control (no implants); 2) non-washed, non-coated Compudose implants; 3) washed implants coated with at least 0.7 mg oxytetracycline powder per implant. All treatments were represented equally in each of three blocks. Each block was assigned to three 10-acre pastures of smooth brome grass. Cattle within each block were rotated among the three pastures at 2-week intervals.

Steers in each block had access to an automatic waterer and a mineral feeder containing a mixture of equal parts steamed bone meal and trace mineral salt. Supplemental feed was provided as necessary to maintain an average daily gain of at least one pound. Implants were palpated on days 28 and 56 and steers with missing implants were reimplanted. Implants were palpated again at the end of the study. Sexual behavior (mounting activity) of the steers was monitored daily during the first 28 days of the study. Initial and final weights were taken following a 16-hour shrink from feed and water. The study was terminated on October 28, 1983 (168 days).

Results: Results of this study are presented in Table 22. Steers implanted with non-coated and oxytetracycline-coated Compudose gained 20.3% (51 lb) more ($P < .01$) and 13.7% (33 lb) more ($P < .01$), respectively, than nonimplanted controls. There was no significant difference ($P > .05$) between performance of steers implanted with the two different types of Compudose. Average gain improvement of Compudose-implanted steers over non-implanted controls was 17%.

On day 28 of the study, one oxytetracycline-coated Compudose implant was missing and the steer was reimplanted. All implants were present on day 56 and at the termination of the study. Two steers with non-coated Compudose implants and one steer with an oxytetracycline-coated Compudose implant exhibited mounting activity during the first 28 days of the study. No other sexual activity was observed.

Conclusions: Compudose implants significantly increased gains of grazing steers. Addition of an oxytetracycline coating to Compudose implants had no effect on steer performance.

Table 22. Effect of Oxytetracycline-Coated Compudose Implants on Gains of Grazing Steers (168 days).

Item	Control	Untreated Compudose	Oxytetracycline Coated Compudose
No. of steers	27	27	27
Initial wt., lb.	547	552	554
Final wt., lb.	805	861	845
Total gain, lb	258	309	291
Average daily gain, lb.	1.53[a]	1.84[b]	1.74[b]

[a,b]Means with different superscripts differ significantly (P <.01).

Effect of Processing Method on Salt Intake by Beef Cattle [1]

A series of studies were conducted to determine the effect of adding dextrine, a binding agent, to rock salt blocks on salt consumption by beef cattle. Dextrine is added to the salt before it is compressed into blocks by the block press. Consumption of evaporated salt blocks also was monitored for use as a standard for comparison. Previous research has shown that cattle have no preference between evaporated and rock salt blocks and that consumption of the two types of blocks is equivalent.

Procedure: A series of studies with grazing beef cattle was started in early to mid-June and terminated in late September. Cattle in each study were offered evaporated salt blocks, rock salt blocks without dextrine and rock salt blocks with dextrine on an *ad libitum* basis. All three types of salt blocks were available to each group of cattle at all times. No other sources of salt were available. Salt consumption was measured by weighing salt blocks when they were fed and subtracting the weight of any unconsumed salt remaining at the termination of the study.

Results: A summary of the project is presented in Table 23. A total of eight groups of cattle were utilized, with an average of 26 head of mature cows and yearlings in each group. Average duration of the studies was 92 days. Salt was fed in either covered or uncovered feeders. Since there was little rainfall during this period, there was little weathering of

[1] Salt and partial financial assistance provided by Carey Salt, Hutchinson, KS.

of blocks in either type of feeder.

Salt consumption was the highest form the evaporated block with average consumption being .235 ounces per head daily. Consumption of the rock blocks without and with dextrine were equivalent (.155 and .154 ounces per head daily, respectively). Although consumption of the evaporated blocks was greater than that of either of the rock blocks, total consumption of rock blocks (w/o dextrine + w̄ dextrine) was greater than consumption of evaporated blocks (.309 vs .235 ounces per head daily, respectively). This result is in agreement with earlier work conducted at this research unit.

Conclusion: Dextrine had no effect on consumption of rock salt blocks. Total consumption of rock blocks was greater than from evaporated blocks.

Table 23. Cattle Preference for Different Types of Salt Blocks (Evaporated, Rock without Dextrine, and Rock with Dextrine).

Location	No. of Days	No. of Cattle	Salt Consumption (oz/hd/day)		
			Evaporated	Rock w/o Dextrine	Rock $\bar{w}$ Dextrine
A	103	28	.17	.14	.23
B	89	31	.34	.28	.21
C	91	27	.12	.02	.07
D	91	27	.13	.04	.06
E	91	28	.29	.16	.14
F	91	30	.16	.10	.10
G	91	20	.23	.16	.14
H	91	20	.44	.34	.28
MEANS	92	26	.235[a]	.155[b]	.154[b]

[a,b] Mean values with different superscripts differ significantly (P <.10).

Effect of Actaplanin[1] on Performance of Grazing Steers

Actaplanin, an experimental feed additive, is a complex of glycopeptide compounds produced by *Actinoplanes missouriensis*. It enhances propionic acid production without reducing total volatile fatty acid production. Two studies were conducted to determine the most effective dosage for promoting increased rate of weight gain by grazing steers.

Procedure:

Experiment A

In experiment A, 32 yearling Hereford steers with an initial weight of 506 lb were used to evaluate the effect of free choice feeding a loose mineral mixture containing 0, 2, 3, and 4 mg of actaplanin per gm. Steers were blocked by weight and assigned randomly to the four actaplanin treatments. Eight steers were assigned to each of four 10-acre brome pastures. Cattle were rotated between pastures every 7 days. Mineral was fed *ad libitum* in wind vane mineral feeders and weighed weekly to determine mineral and actaplanin intake. The mineral mixture was the only source of supplemental mineral offered. All animals were fed 2 lb of corn per head daily during the entire 119-day trial (April 8 - August 5, 1981). Initial and final weights were the average of two nonshrunk weights taken on consecutive days.

Experiment B

In experiment B, 81 yearling Angus steers with an initial weight of 533 lb were used to evaluate actaplanin at levels of 0, 600, 900, and 1200 mg in 1 lb of corn supplement per head fed twice weekly (average mg/head/day dosages of 0, 171, 257 and 343, respectively). Steers were blocked by weight, assigned randomly to one of the four treatments and allotted to nine 10-acre smooth bromegrass pastures with nine steers per pasture. The block of lightweight cattle contained two control groups and one group for each level of actaplanin. The heavyweight block had one group assigned to each treatment. Steers within a block were rotated between pastures at 14-day intervals and fed the supplements on Mondays and Thursdays. Supplemental feed was provided uniformly to all cattle when availability of high quality forage declined. Initial and final steer weights were the average of two nonshrunk weights taken on consecutive days. The 112-day trial was initiated on April 7, 1982 and terminated on July 28, 1982.

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[1] Actaplanin is an experimental feed additive that has not yet been approved for use. It is produced by Eli Lilly and Co., Indianapolis, Indiana, which provided the feed additive and partial financial assistance.

Results:

Experiment A

Results of experiment A are present in Table 24. All levels of actaplanin improved performance over the controls. Largest gain increases were with 3 and 4 mg of actaplanin per g of mineral. Actaplanin intake of 144 mg daily resulted in a 13.1% (26 lb) increase ($P < .10$) in gain over the control group; intakes of 255 mg and 353 mg increased ($P < .01$) gain 23.2% (46 lb) and 19.6% (39 lb) respectively. There was no significant difference ($P > .10$) in performance among the three actaplanin levels. In this study, 255 mg of actaplanin per head daily appeared most effective.

Experiment B

Results of experiment B are shown in Table 25. Average daily actaplanin intakes were 0, 171, 257 and 343 mg per head. Cattle receiving actaplanin gained faster than controls. Actaplanin intakes of 171 mg and 257 mg resulted in 12.6% (25 lb) and 12.0% (24 lb) improvements ($P < .01$) in gain, respectively, over controls. Consumption of 343 mg of actaplanin per head daily improved ($P < .10$) gain 5.7% (11 lb) over the control group, but resulted in lower gain than the 171 mg ($P < .10$) and 257 mg ($P < .05$) per day treatments. The most effective doses of actaplanin were 171 mg and 257 mg per head daily.

Conclusions: Feeding actaplanin in a loose mineral mix or twice weekly in a supplement significantly improved gains of grazing steers. The greatest improvement in performance was found with average daily actaplanin intakes of 255 mg or 257 mg per head in the two trials.

Table 24. Effect of Actaplanin in Loose Mineral on Grazing Steer Performance (119 days).

Item	Actaplanin Concentration (mg/g of mineral) 0	2	3	4
No. of steers	8	8	8	8
Initial wt., lb	506	510	506	503
Final wt., lb	706	736	752	742
Total gain, lb.	200	226	246	239
Avg. daily gain, lb.	1.68[ac]	1.90[b]	2.07[bd]	2.01[bd]
Avg. mineral intake, g/hd/day	66.8	72.0	84.9	88.2
Avg. actaplanin intake, mg/hd/day	0	144	255	353

[a,b]Means with different superscripts differ significantly ($P < .10$).

[c,d]Means with different superscripts differ significantly ($P < .01$).

Table 25. Effect of Feeding Actaplanin Twice Weekly on Grazing Steer Performance (112 days).

Item	Actaplanin Concentration (mg/lb of supplement) 0	600	900	1200
No. of steers	27	18	18	18
Initial wt., lb.	526	538	537	535
Final wt., lb.	722	759	757	742
Total gain, lb.	196	221	220	207
Avg. daily gain, lb.	1.75[ac]	1.97[bd]	1.96[bf]	1.85[eg]
Avg. actaplanin intake, mg/hd/day	0	171	257	343

[a,b]Means with different superscripts differ significantly ($P < .01$).

[c,d,e]Means with different superscripts differ significantly ($P < .10$).

[f,g]Means with different superscripts differ significantly ($P < .05$).

Alfalfa Pellets Compared with Grain as Creep Feed for Suckling Calves

Creep feeding usually increases weaning weights of beef calves by 40 to 80 lb. Greatest response to creep feeding has been obtained with fall calves, calves born to cows that are poor milkers or to cows that are two years old or more than nine years old, and when pasture conditions are poor. Creep feeding has declined in popularity in recent years due to one or more of the following reasons: high feed costs, low feeder-calf prices, retained ownership of cattle in a high forage program following weaning, and fleshy calves being sold at a discount.

Concern also has been expressed about creep feeding of heifers reducing their subsequent productivity as brood cows. A study at the University of Illinois showed that when British bred heifers were creep-fed as nursing calves, they produced less milk and weaned lighter calves after calving at 2 years of age than their noncreep-fed counterparts. However, recent Montana State research has shown that subsequent milk production of heifers sired by large-framed exotic sires was not affected adversely by creep feeding them during the nursing period when they were calves. Based on these studies, it appears that small-framed, early-maturing heifers are more likely to have subsequent milk production adversely affected by creep feeding than are larger framed, later maturing heifers. Regardless of cattle type, all of the disadvantages associated with creep feeding, with the exception of low feeder-calf prices, can be avoided by feeding a creep ration that is higher in protein and lower in energy. This study compared alfalfa pellets and a grain mixture of 2/3 oats and 1/3 corn as creep rations for fall-dropped calves.

Procedure: Twenty-two fall-dropped Simmental x Angus and Simmental x Hereford calves (14 steers and 8 heifers) were allotted equally by weight, sex, and breed to two groups on December 15, 1982. One group was creep fed alfalfa pellets (17.5% crude protein on 100% DM basis) and the other group was creep fed a grain mixture of 2/3 whole oats and 1/3 whole corn. Each group of calves and their respective dams were wintered on 15-acre fescue pastures and were fed big round bales of mixed grass hay *ad libitum* from round, slant-bar feeders. Calves were weaned on May 3, 1983 when they were approximatley 7 months old.

Results: Results of this study are presented in Table 26. One calf was removed from the alfalfa pellet group for reasons unrelated to experimental treatment. Average daily gains of calves creep fed alfalfa hay and grain were 1.71 and 2.08 lb., respectively. Calves that were creep-fed grain gained 21.6% more (52 lb) ($P < .01$) than those fed alfalfa pellets. Average daily consumption of alfalfa pellets and grain was 3.14 and 5.38 lb per head, respectively. Therefore, it would appear that most of the difference in gain was due to the difference in creep feed intake. Earlier studies at this station have shown no significant differences between performance of calves creep fed alfalfa hay and those creep fed a grain mixture of 2/3 oats and 1/3 corn. However, in those studies consumption of hay and grain were similiar.

Conclusions: Fall calves creep fed a grain mixture of 2/3 oats and 1/3 corn gained significantly more weight than those creep fed alfalfa pellets. Differences in gain were attributed largely to higher intake of grain than alfalfa pellets.

Table 26. Alfalfa Pellets Compared with Grain as Creep Ration (138 days).

Item	Alfalfa Pellets	Grain
No. of calves	10	11
Initial wt., lb.	196	198
Final wt., lb	432	486
Total gain, lb.	236[a]	288[b]
Average daily gain, lb	1.71[a]	2.08[b]
Average daily creep feed intake, lb	3.14	5.38

[a,b]Means with different superscripts differ significantly ($P < .01$).

Comparative Effects of Rumen-Active Compounds on the Performance of Finishing Steers[1]

Lasalocid sodium (Bovatec[R], Hoffmann-La Roche, Inc.) and monensin sodium (Rumensin[R], Eli Lilly and Co.) are two major feed additives that are currently approved for use to improve feed efficiency of finishing beef cattle. These additives are similar in several respects. Both antibiotics were used as poultry coccidiostats before they were used as feed additives for cattle and both additives tend to reduce the incidence of lactic acidosis, bloat and acute bovine pulmonary edema. However, Monensin is approved for use with the antibiotic tylosin (Tylan[R], Eli Lilly and Co.) while lasalocid presently is not approved for feeding with an antibiotic. This study evaluated monensin with and without tylosin and lasalocid for their effects on feedlot performance and carcass parameters of finishing steers.

Procedure: One hundred sixty mixed English-bred steers averaging 592 lb were assigned to a finishing study with a randomized block design of four weight blocks and four treatments per block on February 9, 1983. Steers were allotted to blocks by weight and breed and assigned randomly to treatments. Sixteen pens of 10 steers each, in four blocks with four pens per treatment were used. Treatments evaluated were: 1) an unmedicated control; 2) lasalocid at 25 grams per ton of feed (air dry basis); 3) monensin at 12.5 grams per ton of feed for 21 days then 25 grams per ton of feed (air dry basis); and 4) monensin at 12.5 grams per ton of feed for 21 days, then 25 grams per ton of feed plus tylosin at 10 grams per ton of feed (air dry basis). All steers were started on 70% corn silage, 21% whole shelled corn and 9% supplement (100% dry matter basis). Percentage of corn was increased gradually and silage decreased to bring cattle up to full feed in 21 days. Final ration composition (DM basis) was 15% corn silage, 76% whole shelled corn, and 9% supplement. Cattle were kept in dirt lots that had no cover or wind protection. Feed was provided ad libitum once daily in fenceline bunks. All cattle were implanted with Compudose at the start of the study. Implant retention was determined at 28 days and final weighing. Cattle were weighed initially following a 16-hour shrink from feed and water. Final weights were full weights. Two blocks were removed from the study on June 29, 1983 (140 days) and slaughtered on June 30, 1983. The remaining two blocks were removed from the study on July 13, 1983 (154 days) and slaughtered on July 14, 1983. Carcass measurements obtained included hot carcass weight, cold carcass weight, quality grade, yield grade and liver abcess incidence (for 20 steers in each treatment).

Results: Results of this study are presented in Table 27. One steer was removed from the lasalocid treatment because he had difficulty moving to the feed bunk. He apparently foundered. Examination of his liver at

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[1] Feed additives and partial financial assistance provided by Eli Lilly and Co., Indianapolis, Indiana.

slaughter revealed severe abcesses. Steers fed lasalocid, monensin and monensin + tylosin gained 3.9% ($P < .10$), 4.5% ($P < .05$) and 3.6% more ($P < .10$), respectively, than controls. Lasalocid and monensin + tylosin resulted in 9.2% ($P < .05$) and 9.5% lower ($P < .10$) dry matter intake, respectively, than did monensin alone. Feed efficiency as measured by dry matter intake per unit of gain was improved by all treatments as compared to the control group, although these differences were not significantly different ($P > 10$). Lasalocid, monensin and monensin + tylosin reduced dry matter intake per unit gain by 10.0%, 1.7% and 10.2%, respectively, when compared to the control group.

Carcass parameters were similar between treatments. Incidence of liver abcesses was higher in all treatments than in the control group; however, only the monensin group had a significantly higher ($P < .05$) level of liver abcesses than controls.

Conclusions: Feeding lasalocid, monensin, and monensin + tylosin resulted in improved performance of finishing steers. Highest level of overall performance was obtained with the lasalocid and monensin + tylosin treatments.

Table 27. Effect of Rumen-Active Compounds on Steer Performance (147 days).

Item	Control	Lasalocid	Monensin	Monensin + Tylosin
No. of steers	40	39	40	40
Initial weight, lb	591	591	592	592
Final weight, lb	1081	1100	1103	1099
Total gain, lb	490	509	511	507
Average daily gain, lb	3.33^{a}	3.46	3.48^{b}	3.45
Average daily dry matter intake, lb	20.03	18.62^{a}	20.50^{bc}	18.56^{d}
Dry matter intake/gain	6.00	5.40	5.90	5.39
Hot carcass wt, lb	647	655	651	650
Dressing %	59.8	59.5	59.0	59.1
Quality grade[1]	11	12	12	11
Yield grade	2.4	2.4	2.5	2.5
Liver abcess incidence, %[2]	5.0^{a}	15.8	25.0^{b}	15.0

[1]Quality grade: Good $^{+}$ = 11, Choice $^{-}$ = 12.

[2]Liver abcess data obtained for only two pens/treatment.

[a,b]Means with different superscripts differ significantly ($P < .05$).

[c,d]Means with different superscripts differ significantly ($P < .10$).

Effect of Feeding Lasalocid[1] in a Liquid Supplement on Finishing Steer Performance

Lasalocid (Bovatec[R]) is an ionophore that was approved for use as a feed additive for feedlot cattle in August of 1982 by the Food and Drug Administration. The approved doseage is 10 to 30 grams per ton of ration dry matter. The following study was conducted to determine the effect of feeding a liquid supplement containing lasalocid to finishing steers.

Procedure: Sixty-four Angus and 64 Angus x Hereford steers (817 lb) were blocked by weight and allotted equally to 16 pens of eight steers each on September 22, 1982. The 16 pens of steers then were allotted equally to the following treatments: 0, 10, 20, or 30 grams of lasalocid per ton of dry matter. All cattle were started on 60% corn silage, 30% dry whole shelled corn and 10% liquid supplement (32% crude protein) on a 100% dry matter basis. The level of silage was decreased and the level of corn increased 5% daily until the final ration of 20% corn silage, 70% dry whole shelled corn and 10% liquid supplement on a 100 % dry matter basis was reached. Cattle were not implanted. The Angus steers were weighed off of the study on December 23, 1982 (92 days) and then slaughtered on December 28, 1982. The crossbred steers were weighed off of the study on January 12, 1983 (112 days) and slaughtered on January 18, 1983. Initial and final weights were taken following a 16-hour shrink from feed and water. Individaul carcass data were collected for each steer.

Results: Results of this study are listed in Table 28 by lasalocid treatment. One steer was removed from the 10-gram treatment for reasons unrelated to the experimental treatment. Feeding 10, 20, and 30 grams lasalocid per ton of dry matter increased gains of finishing steers by 8.3% (27 lb) ($P < .05$), 10.9% (35 lb) ($P < .01$), and 10.6% (34 lb) ($P < .01$), respectively. There was no significant difference ($P > .10$) in gain between cattle fed various levels of lasalocid. Daily dry matter feed intake was similar for all treatments. Cattle fed 30 grams of lasalocid per ton of dry matter were most efficient in converting feed to gain, requiring 11.4% ($P < .05$) less feed per lb of gain than the controls. Carcass parameters were similar for all treatments.

Conclusions: Feeding lasalocid in a liquid supplement at 30 g per ton of dry matter resulted in significant improvements in gain and feed efficiency. Ten and 20 grams of lasalocid per ton significantly improved gain but did not have a significant effect on feed efficiency.

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[1] Lasalocid and partial financial assistance provided by Hoffmann-La Roche, Inc., Nutley, N.J.

Table 28. Effect of Feeding Lasalocid in a Liquid Supplement on Finishing Steer Performance (102 days).

Item	Level of lasalocid (g/ton of dry matter) 0	10	20	30
No. of steers	32	31	32	32
Initial wt., lb.	818	816	817	817
Final wt., lb.	1128	1153	1162	1161
Total gain, lb.	310	337	345	344
Average daily gain, lb.	3.03[a,c]	3.28[b]	3.36[b,d]	3.35[b,d]
Average daily dry matter intake, lb	24.46	25.70	25.80	23.85
Dry matter intake/gain	8.07[a,e]	7.82[e]	7.68[e]	7.15[b,f]
Fat thickness, in.	.40	.44	.42	.43
Quality grade	Ch^-	Ch^-	Ch^-	Ch^-
Yield grade	2.3	2.6	2.4	2.6
Liver abcesses incidence, %	0	0	0	3.1

[a,b]Means on the same line with different superscripts differ significantly ($P < .05$).
[c,d]Means on the same line with different superscripts differ significantly ($P < .01$).
[e,f]Means on the same line with different superscripts differ significantly ($P < .10$).

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FORAGE CROPS RESEARCH

J. L. Moyer

Birdsfoot Trefoil Varieties in Southeastern Kansas

Birdsfoot trefoil is a widely adapted, non-bloating forage legume. One variety, 'Dawn' has shown good persistence and yield potential in eastern Kansas. Other varieties and cultivars are being tested in pure stands for hay production and adaptation to our conditions.

Procedure: Plots established in spring, 1980 were maintained in 1982 with a fertilizer application of 50 lb P_2O_5 and 100 lb K_2O/acre. Plots were cut late (June 21) because of wet conditions. Subsequent growth was too short for mechanical harvest.

Results: Forage yield of the nine cultivars did not differ significantly in 1983. (Table 29). Three-year yield totals were significantly higher for 'Dawn', 'Fergus', and 'Empire' than for 'Leo', 'Carroll', and 'Norcen'.

Cool-Season Grass Performance

Introduced cool-season grasses have proven themselves valuable for forage in southeast Kansas. This test was undertaken to evaluate new varieties of several species for adaptation and productivity under our conditions.

Procedure: Plots were established on the Parsons State Hospital grounds by seeding at 25 lb/acre in spring, 1981. Plots were fertilized preplant with 40-40-40 lb/acre of N-P_2O_5-K_2O, in February, 1982 with 100-40-40, and March 10, 1983 with 100 lb N/acre. Grasses were cut May 26, 1983 for yield determination.

Results: Reed canarygrass lines yielded most as a group in 1981. (Table 30). Bromegrasses also generally did well, while orchardgrasses were similar in production to tall fescue. 'Hallmark' orchardgrass was the exception, yielding as much as reed canarygrass. Two-year average yields showed smooth bromegrass to be the highest yielding species.

Table 29. Birdsfoot Trefoil Variety Forage Yields from April, 1980 Seeding, Mound Valley Unit, SEK Experiment Station.

Cultivar	Forage Yield, tons/acre @12% moisture 1983	3-Year Total
Empire	3.42	11.92
Mo 20	3.54	11.85
Fergus	3.72	12.06
Dawn	3.98	12.22
Viking	3.53	11.37
NC-83 germ pool	3.73	11.36
Carroll	3.23	10.80
Leo	3.29	10.76
Norcen	3.60	10.94
Average	3.56	11.48
LSD (.05)	NS	0.97

Table 30. Yield of Cool-season Grasses in 1983 at Parsons Training Center, SEK Branch Experiment Station.

Variety	Species	Source	Yield, tons/acre @12% moisture 1983 [1/]	2-yr Average
Achenbach	Smooth bromegrass		2.72	3.88
Dart	Orchardgrass	L. L.	2.46	3.40
Baylor	Smooth bromegrass	NAPB	2.91	4.20
Blair	" "	NAPB	3.30	4.62
NAPB 7601	" "	NAPB	3.88	4.52
Bromex	Smooth bromegrass	N-K	3.49	4.42
Rebound	" "	S.D.	3.61	4.22
Barton	" "	L.L.	2.47	3.58
Regar	Meadow bromegrass	USDA	2.29	2.17
Ky 31	Tall fescue		3.28	3.86
Sterling	Orchardgrass	IA.	1.96	3.04
Able	"	FFR	3.27	3.42
Hallmark	"	FFR	4.06	4.18
Prime	"	N-K	3.14	3.47
Comet	"	N-K	3.48	3.61
Orion	Orchardgrass	N-K	2.43	2.95
DS-4	"	L. L.	2.78	3.45
Ioreed	Reed canarygrass	Ia.	4.04	4.30
NCRC-1	"	USDA	3.89	3.98
Mn 76	"	Mn	3.48	3.86
Mn 72	Reed canarygrass	Mn	4.70	4.72
Vantage	"	NAPB	3.03	3.60
Rise	"	NAPB	3.76	3.58
Flare	"	L. L.	3.35	3.38
Linn	Perennial ryegrass	Ore.	3.58	3.14
Tetrablend 30	" "	N-K	2.51	2.86
Barton	Western wheatgrass		3.54	3.42
Oahe	Intermediate wheatgrass		1.82	2.75
OG-1	Orchardgrass	Mo.	2.51	3.07
OG-2	"	Mo.	3.62	3.72
LSD (.05)			0.99	- -

1/ Cutting date was May 26.

Forage Yield From Tall Fescue Cultivars

Tall fescue is the most widely grown forage grass in southeastern Kansas. New cultivars with possible agronomic advantages were tested for adaptation to the area.

Procedure: Plots seeded in fall, 1981 were clipped in 1982, and fertilized with 100-40-40 lb/acre of N-P_2O_5-K_2O, and with 100 lb N/acre in 1983. Harvest date in 1983 was May 31.

Results: 'Kentucky 31' tall fescue, obtained locally, produced the highest yield, significantly greater than five of the 11 other cultivars in the test. Conversely, 'Kenhy' produced significantly less than the five highest yielding cultivars.

Table 31. Forage Yields of Tall Fescue Cultivars and Varieties in 1983, Mound Valley Unit, SEK Experiment Station.

Entry	Source	Forage Yield 1/
Kenhy	U. Kentucky	3.86
K5-30	Northrup-King	4.52
Ky 03G1-327	U. Kentucky	4.14
WG 3B	U. Missouri	4.00
H 2	U. Missouri	4.25
Ky 31	Common	4.78
H 1	U. Missouri	4.62
Forager	FFR	4.10
Mo 96	U. Missouri	4.72
LMR	U. Missouri	4.31
WG 2B	U. Missouri	4.20
HMR	U. Missouri	4.50
LSD (.05)		0.58

1/ tons/acre @ 12% moisture.

Alfalfa Varieties in Southeastern Kansas

Two alfalfa tests were underway in 1983 at Mound Valley. Performance of 24 varieties has been measured since 1978, and was published through 1981 (Ag Facts No. 96, May 1982). This report will update previous ones with two cuttings obtained in 1983, and give early results from a new 20-line test seeded in fall, 1982.

Procedure: The 24-variety test was cut late (May 27) because of the cool spring and wet soils near harvesttime. Only three replications were cut because the fourth was on wetter ground. The second cutting was taken June 30, and drought prevented sufficient regrowth for harvesting.

The 20-line test was not cut during the first harvest cycle because of slow development in the new seeding. By the second harvest cycle on June 28 plots had bloomed fully. An after-frost cutting was taken November 3 to assess fall growth after the summer drought.

Results: Yields from the 24-variety test for 1983 and for 6 years are in Table 32. No differences in stand persistence were noted thus far. More than 2 tons/acre of forage production separate the first from the last variety, a gross difference worth more than $100 or almost $20/acre/year.

Yields of the 20-line test seeded in fall, 1982 ranged from 2.5 to 3.26 tons/acre in 1983 (LSD .05 = 0.4). The top-yielding line, K81-10, was significantly better than half of the 20 lines in the test. The top 4 lines, K81-10, Paymaster 'Expo', K81-7, and Pioneer brand 532, yielded significantly more than the four poorest-yielding lines.

Table 32. Alfalfa Forage Production from 24 Varieties Planted in Spring, 1978, Mound Valley Unit, SEK Experiment Station.

		Forage Yield, tons/acre @12% moisture			
		1983 Production			6-Year
Variety	Source	5/27	6/30	Total	Production
120	DeKalb	3.08	1.80	4.88	23.68
130	DeKalb	2.73	1.83	4.56	23.65
Olympic	NAPB	2.71	1.72	4.44	23.47
Thor	Northrup-King	2.45	1.63	4.08	23.46
Weevlchek	FFR	2.69	1.64	4.33	23.45
Apollo	NAPB	2.55	1.87	4.42	23.45
Hi-Phy	FFR	2.64	1.90	4.54	23.44
Epic	Land O'Lakes	2.79	1.87	4.66	23.39
Pacer	Land O'Lakes	2.64	1.87	4.51	23.26
531	Pioneer	2.76	1.84	4.61	23.13
Vanguard	NAPB	2.36	1.90	4.26	23.07
545	Pioneer	2.53	1.87	4.40	22.88
Arc	USDA	2.78	1.46	4.24	22.55
Atlas	NAPB	2.51	1.67	4.19	22.53
Vernal	USDA-Wisc	2.84	1.57	4.42	22.38
Gladiator	Northrup-King	2.46	1.42	3.87	22.24
Sunrise	NC+	2.42	1.50	3.92	22.22
Kanza	USDA-KSU	2.53	1.58	4.11	22.20
Riley	USDA-KSU	2.49	1.41	3.91	22.11
Cody	USDA-KSU	2.45	1.73	4.18	21.84
Baker	USDA-Neb	2.74	1.56	4.30	21.72
Saranac	USDA-NY	2.36	1.68	4.04	21.61
521	Pioneer	2.23	1.58	3.82	21.56
Tempo	FFR	2.24	1.50	3.74	21.54
$LSD_{.05}$		0.37	0.27	0.44	- -
Average		2.58	1.68	4.27	22.70

Rates of Potash, and Rates and Methods of Phosphate Fertilization on Supplementally Irrigated Alfalfa[1]

Optimum rates of phosphate, potash, and micronutrients have yet to be determined under supplemental irrigation in southeastern Kansas. This study was to determine those rates, evaluate the benefit of knifing phosphate, and to help determine the economic feasibility of irrigating alfalfa on claypan soils receiving about 40" of annual precipitation.

Procedure: Plots were treated with designated fertilizers and seeded at 25 lb/acre with 'Classic' alfalfa, then treated with benefin preemergence herbicide in April, 1980. Initial soil test indicated pH of 5.9, available P at 46 lb/acre, and exchangeable K of 201 lb/acre, both in the medium to high range.

Plots were clipped in 1980, but no yields were taken during that droughty year because scarce water was not used to irrigate the alfalfa plots. Five cuttings were taken in 1981, totalling an average of 5.8 tons/acre, but water was still sometimes limiting. No treatment differences were found. Plots were sprayed in spring 1981 to control aphids.

For 1982, the irrigation pond was enlarged, and uniformity of spray coverage was improved. Phosphate and potash treatments were applied again in March. About 1.5 acre-inches was applied to plots in late July and about 3" in late August. Plots were cut five times for yield, and moisture samples assayed from the last cutting for N, P, and K contents (see Report of Progress 419).

Fertility treatments for 1983 were applied March 2. Plots were watered July 15 with 1.3", July 19 with 1.0", July 25-26 with 2.5", and August 8-9 with 1.4". Plots were cut late the first time because of excessively wet conditions, and July growth was poor because of dry and hot conditions.

Results: Yields responded best to K_2O application (Table 33). Two of the three cuttings and total yield exhibited significant K responses. The 100-lb rate was significantly higher-yielding than no potash except in the third cutting, but the yield advantage of the 200-lb over the 100-lb rate usually was not significant.

Phosphorus responses were small, and usually non-significant. However, in the first cutting, the mean yield of the 120-lb rate treatments was significantly greater than that of the 40-lb rate treatments, and the 80-lb rate produced significantly more than plots that received no P.

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[1] Written with the collaboration of D. W. Sweeney.

Knifing P was of little advantage here, probably because of the poor overall P response. The average total yield of broadcast treatments was 5.5 tons/acre, while knifed treatments totalled 5.7 tons/acre.

Table 33. Effect of Potash Rate, and Phosphate Rate and Method on Average Yields of Irrigated Alfalfa.

K_2O Rate	P_2O_5 Rate	P_2O_5 Method	Forage Yield, tons/acre @12% moisture 5/25 1/	7/1	8/24 1/	Total
- - lb/acre - -						
0			2.36a 2/	1.27a	1.59a	5.22a
100			2.45ab	1.43b	1.76a	5.63b
200			2.54b	1.74c	1.68a	5.96b
	0	- -	2.21a	1.55ab	1.64a	5.40a
	40	B.C.	2.32ab	1.39a	1.58a	5.29a
	80	"	2.42ab	1.40a	1.72a	5.53a
	120	"	2.56b	1.56ab	1.59a	5.70a
	40	KN	2.37ab	1.41a	1.71a	5.49a
	80	"	2.54b	1.66b	1.68a	5.89a
	120	"	2.49b	1.46ab	1.78a	5.73a

1/ Weed invasion apparent on first cutting, significant on third.

2/ According to Duncan's test, averages within a column followed by the same letter were not significantly different (0.05 level).

Bermudagrass Variety Performance

Bermudagrass can be a valuable, high input-requiring, high-producing summer forage for southeast Kansas cattlemen. Producers have benefitted considerably from the replacement of the original common bermudas with the variety 'Midland'. Developments in bermudagrass breeding should be monitored closely to speed adoption of improved types.

Procedure: Thirteen lines were planted in 1980 and harvested for yield determination twice each year for 3 years. Two others, 'Tift 44' and 'Harris' were sprigged in 1981. Weeds were controlled with simazine, and plot borders were maintained with glyphosate.

Plots were fertilized regularly, receiving 150 lb N/acre on June 14 in 1983. Harvests in 1983 were on June 30 and August 30.

Results: 'Hardie' yielded significantly more in 1983 than all other lines except for line 74 x 12-6 and 'Midland'. First-cut yield of 'Hardie' was significantly higher than all other lines except 'Midland', and second-cut yields of 'Hardie' ranked ahead of 'Midland' for the first time, second only to line 74 x 12-6.

Table 34. Forage Yield of Bermudagrass Cultivars, 1983, Mound Valley Unit, Southeast Kansas Experiment Station.

Cultivar	Forage Yield, tons/acre @12% moisture			
	Cut 1 (6/30)	Cut 2 (8/30)	Annual Production	
			1983	3-yr average
Midland	3.36	2.44	5.80	6.16
Hardie	4.00	2.66	6.66	6.06
SS16 X SS21[1/]	2.97	1.76	4.72	5.60
74 X 12-6	3.17	2.98	6.15	5.55
74 X 14-1	3.30	2.17	5.48	5.32
LCB 7-25	3.07	1.99	5.06	4.90
74 X 12-1	2.96	2.21	5.17	4.84
74 X 12-5	3.88	1.34	5.22	4.79
Guymon X 9959[1/]	2.92	1.59	4.51	4.67
Guymon X 9945[1/]	3.41	1.28	4.68	4.54
Harris	2.86	1.29	4.15	4.28[2/]
74 X 9-1	2.64	1.69	4.34	4.09
Guymon X 10978[1/]	2.53	0.94	3.46	4.08
74 X 12-12	1.84	1.47	3.31	4.08
Tift 44	2.28	1.72	4.00	3.79[2/]
$LSD_{.05}$	0.70	0.47	1.02	- - -

[1/] Seeded cultivars

[2/] Two year averages, established in spring, 1981.

Cool-Season Annual Legumes for Southeast Kansas

A good winter annual could produce higher quality forage at minimal cost and could benefit following crops with residual N. Diverse types were tested for adaptation.

Procedure: Three-row plots 30-feet in length were seeded September 28, 1982 to 12 legumes. Large-seeded legumes (fieldpea, vetch, and lupine) were seeded at the rate of 35 lb/acre, arrowleaf clover was seeded at 10 lb/acre, while crimson and subclover were seeded at 15 lb/acre.

Plots were cut after all had reached maturity. Crimson clover, vetch and fieldpea were quite mature (Table 35), but shattering of plant parts was minimal by the harvest date of June 28, 1983.

Results: 'Frost' blue lupine and 'Geralton' subclover had insufficient stands for harvest. Stands were also incomplete for 'Vantage' and 'Nova II' vetches and 'Mt. Barker' subclover.

'Yucchi' arrowleaf clover was the latest maturing and highest yielding legume in the test (Table 35). 'Fenn' Austrian winter fieldpea also yielded well, despite its early maturity.

Table 35. Cool-season Annual Legume Production and Moisture Content, Mound Valley Unit, Southeast Kansas Experiment Station.

Cultivar	Species	Forage Yield [1/]	% Moisture
Yucchi	Arrowleaf clover	3.84	61
Fenn	Austrian winter fieldpea	3.40	21
Vanguard	Common vetch	2.71	17
Melrose	Austrian winter fieldpea	2.65	15
Vantage	Common vetch	2.52	11
Cahaba	White vetch	1.52	21
	Crimson clover	1.10	42
Nova II	Common vetch	0.94	26
Woogenellup	Subclover	0.63	26
Mt. Barker	Subclover	0.62	36
Geraldton	Subclover	- -	--
Frost	Blue lupine	- -	--
$LSD_{.05}$		0.75	

[1/] Tons/acre @12% moisture, on June 28.

Effect of Fertility, Mechanical Renovation and Lime on Tall Fescue and Interseeded Red Clover

Interseeding a legume into tall fescue can reduce fertilizer costs, improve forage quality, and lengthen the season of productivity. This study was designed to test the effects of three factors important to legume establishment on the amount and quality of forage produced.

Procedure: Plots were located south of Girard on the Joe Murnane farm, where soil pH was less than 6.0 in the top 2 inches. Three rates of lime were used November 2, 1979: 0 (control), 2500 and 5000 lb of effective calcium carbonate (E.C.C.) equivalent.

Fertilizer was applied April 14, 1980 at 80-40-40 lb/acre to plots left in fescue, and at 0-40-40 or 0-80-80 in plots for interseeding, and one qt/acre of Paraquat was applied April 15. Half the plots were mechanically renovated April 22 by 'ripping' at 3-5 inch depth with 2-inch chisel points on 9-inch spacings, then smoothed with two passes of a spike-tooth harrow. 'Kenstar' red clover was interseeded at 12 lb/acre with a Midland "Zip" seeder.

Red clover seedlings died because of 1980 drought, so plots were reseeded in February, 1981. Plots were fertilized as before in 1981, and on March 10, 1982.

Plots were cut June 21, 1983 for yield determination. Soil samples were collected from three replications at 2-inch increments to a 6-inch depth on December 22, 1982.

Results: Forage Yields

Lime and interseed-fertility treatments significantly affected forage yields in the single cutting of 1983. Mechanical renovation or "ripping" in 1980 had no effect on 1983 yields, either alone or in combination with lime or interseed-fertility treatments.

Both lime rates increased forage production significantly over the control (Table 36). There was no interaction between lime rate and interseed-fertility treatment, indicating that fescue-only plots and the interseeded red clover plots responded similarly to lime.

Interseeded red clover with the higher fertility regimen (80 lb P_2O_5-80 lb K_2O/acre) produced significantly more forage than red clover with the lower fertilizer rates (Table 37). Fescue that received 80-40-40 was intermediate in yield.

Results: Soil Analyses

Soil pH and ECC requirement responded to lime treatment (see Table 38). The higher lime rate had little additional effect over the lower rate in the top two inches, but definitely affected soil reaction deeper in the soil at the end of the 3-year period. The fact that red clover production did not respond to the improved soil reaction indicated that pH at the rooting depth in the control was not low enough to be limiting.

Available soil P content of the surface 2 inches was affected very significantly by the interseed-fertility treatment (Table 39). Red clover with the lower fertility rate had less soil P than fescue alone, which inturn had less than did red clover fertilized at the higher rate.

Exchangeable soil K exhibited a trend similar to that of soil P, with clover removing more than plain fescue (Table 39).

Table 36. Forage Production of Fescue and Interseeded Fescue as Affected by Lime Rate.

Lime Rate, tons ECC/acre	Forage Yield, tons/acre @12% moisture
0 (Control)	3.42
1.25	3.74
2.50	3.80
LSD .05	0.27

Table 37. Effects of Interseed-fertility Treatments on Forage Production.

Interseed Treatment	Fertility, lb/acre N	P_2O_5	K_2O	Forage Yield, tons/acre @12% moisture
Fescue only	80	40	40	3.61
Red clover	0	40	40	3.48
Red clover	0	80	80	3.86
LSD .05				0.27

Table 38. Effect of Lime Rate on Soil pH and ECC Requirement at Three Different Depths.

Soil Factor	Lime Rate, tons ECC/acre	Soil Depth 0-2"	2-4"	4-6"
pH	0	5.5	5.8	6.1
	1.25	6.6	6.2	6.2
	2.50	6.7	6.4	6.4
	LSD (.05)	0.24	0.14	0.16
ECC requirement, lb/acre 1/	0	4700	2800	2400
	1.25	800	1900	1700
	2.50	700	1400	1400
	LSD (.05)	700	600	600

1/ Samples with pH too high to run ECC (6.5 or >) were listed as requiring 100 lb/acre rather than 0 for the sake of the analysis of variance.

Table 39. Effect of Interseeding Red Clover and Fertility Rate on Available Soil Phosphorus (P), and Exchangeable Soil Potassium (K).

Soil Factor	Interseed-fertility Treatment	Soil Depth 0-2"	2-4"	4-6"
P, lb/acre	Fescue, 80-40-40	23 b 1/	6 a	5 a
	Clover, 0-40-40	17 a	5 a	4 a
	Clover, 0-80-80	29 c	6 a	5 a
K, lb/acre	Fescue, 80-40-40	243 b	168 b	144 a
	Clover, 0-40-40	208 a	146 a	138 a
	Clover, 0-80-80	225 ab	145 a	140 a

1/ Means within a column followed by the same letter are not significantly different at the 5% level of significance, according to Duncan's test.

OTHER FORAGE RESEARCH

The following topics were also researched in 1983, and are worthy of mention.

Bermudagrass Fertilization - Three fixed rates and three variable regimens (depending on moisture) of N fertilization were continued on 'Midland'bermudagrass, along with two K rates. The fixed rate of 150 N initially, with additions after each cutting according to the previous 30 days' precipitation, has appeared most efficient.

Fescue Fertilization - Three studies of N placement were continued in 1983, and two of them showed substantial yield increases of knifing over broadcasting liquid UAN (see Kansas Fertilizer Research Report of Progress 443, pp. 93-94). Timing of applying two N sources indicated that single applications in December, and August and/or March application split with December were most efficient (see above, pp. 91-92).

Forage Sorghum Performance - Fourteen lines of sorghum were tested for silage production with the Agronomy Department at KSU. Results were published elsewhere ("Kansas Sorghum Performance Tests", Kans. Agr. Exp. Sta. Report of Progress 445). Silage yields averaged almost 17 ton/acre (70% moisture), ranging from 9.4 to 21.1 tons in this droughty year.

Warm-Season Annual Forages - A pasture of sudan with 60 lb N/acre was compared to a pasture of sudan-soybeans. The sudan + N pasture produced better animal gain (2.3 vs 1.9 lb/day) and carrying capacity (457 vs 442 animal days) when grazed August 1-29. Exclosures cut for hay August 31 produced about 3890 lb dry matter/acre in the sudan + N pastures, while 5760 lb/acre was produced in the sudan + soybeans pasture (3750 lb sudan, 2010 lb soybeans). The difference was because cattle grazed the soybean leaves when first placed in the pasture, allowing no further growth and nitrogen production by the legume.

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SOIL AND WATER MANAGEMENT RESEARCH

Daniel W. Sweeney

Tillage and Nitrogen Fertilization Effects on Grain Sorghum Yields in a Grain Sorghum - Soybean Rotation

A wide number of rotational systems are employed in Southeast Kansas. This experiment was designed to determine the effect of selected tillage and nitrogen fertilization options on the yield of grain sorghum in a grain sorghum - soybean rotation.

Procedure: A split plot design with four replications was used with tillage systems as whole plots and N treatments as subplots. The three tillage systems were conventional, reduced, and no-till. The conventional tillage consisted of chiseling, discing, and field cultivation. The reduced tillage system consisted of discing and field cultivation. Roundup was applied at a rate of 0.75 qts/a on the no-tillage areas. The four nitrogen treatments were a) zero N applied, b) anhydrous ammonia (NH_3) knifed to a depth of 6 inches, c) broadcast urea-ammonium nitrate (UAN) solution, and d) broadcast solid urea. Nitrogen application rate was 125 lbs N/a. The grain sorghum grown in 1983 followed a 1982 soybean crop.

Results: No significant differences in grain sorghum yield were found for the tillage by N treatment interaction, tillage means, or N treatment means (Table 40). Average yields were low, ranging from 40.5 to 48.0 bu/a. Notably, at the 1 foot depth, measured soil moisture levels were higher in the no-till plots. Less difference between tillage treatments for soil moisture was found at 2 or 3.3 foot depths throughout the growing season. Regardless, soil moisture levels in all treatments had declined to probable stress conditions by the boot growth stage of the grain sorghum.

Conclusions: Low yields were due primarily to drought conditions during the majority of the growing season. Though not statistically significant, trends indicate possible lower yield response to no-till and broadcasting of UAN solution. Since soil moisture levels were higher in no-till, there must be other soil chemical and/or physical processes that supressed grain sorghum yield in the no-till situations. Data also suggest that in a dry growing season, grain sorghum grown after soybeans may not effectively utilize applied nitrogen fertilizer.

Table 40. Tillage and Nitrogen Fertilization Effects on Grain Sorghum Yields in a Grain Sorghum - Soybean Rotation.

N Treatment	Tillage Treatment			N Mean
	Conventional	Reduced	No-Till	
	- - - - - - - - - - -	bu/a	- - - - - - - - - - -	
No N	45.1	46.2	44.0	45.1
Knifed NH_3	47.5	48.0	40.9	45.5
Broadcast UAN solution	47.9	43.2	40.5	43.9
Broadcast Urea	46.8	46.7	45.7	46.4
Tillage mean	46.8	46.0	42.8	

L.S.D. 0.05 N*Tillage = N.S.
N means = N.S.
Tillage means = N.S.

Effect of Wheat Residue Management on Yield of Soybeans and Soil Moisture Content in a Continuous Wheat-Soybean Doublecrop Rotation

Doublecropping soybeans after wheat is practiced by many producers in Southeast Kansas. Several options exist for dealing with straw residue from the previous wheat crop before planting the doublecrop soybeans. The method of managing the wheat residue may affect soil parameters, such as soil moisture, which in turn, may affect soybean yield.

Procedure: Three wheat residue management systems with three replications of each were established in 1983. The three residue management systems were no-tillage, disc only, and burn then disc. Sparks variety soybeans were planted July 8, 1983 in 30-inch rows. After planting, all plots received 1 gal/a Bronco (a package mix of Lasso and Roundup) and 1/3 lb/a Sencor 75 DF. Soil moisture was measured at depths of 1, 2, and 3.3 feet in each plot area by use of a neutron scattering technique. Soil moisture measurements were taken periodically during the growing season.

Results: Wheat residue management (no-tillage, disc only, or burn followed by discing) had no significant effect on the yield of soybeans grown in a continuous wheat-soybean doublecrop rotation (Table 41). Drought conditions resulted in very low (3.6 to 6.7 bu/a) soybean yields. Soil moisture content showed little treatment influence at the 1 foot depth, however no-tillage resulted in higher soil moisture content at 2 and 3.3 foot depths throughout the growing season.

Conclusions: First year data indicate that in an extremely dry growing season, wheat straw management has little effect on doublecrop soybean yields. Since total rainfall for the first 7 weeks after planting was only 0.3 inches, none of the treatments resulted in soil moisture levels sufficient for development of adequate vegetative growth. Since no-tillage did not result in higher soybean yield, the high clay content subsoil may have prevented effective root penetration and absorption of water potentially available at the deeper depths.

Table 41. Effect of Wheat Straw Management on Yield of Doublecrop Soybeans.

Residue Management	Yield
	- bu/a -
Burn, then disc	6.7
Disc only	3.6
No-tillage	5.8
LSD (0.05)	N.S.

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KSU
KANSAS STATE UNIVERSITY

Agricultural Experiment Station, Kansas State University, Manhattan 66506

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