

Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 8 *Southeast Agricultural Research Center
Reports (2014 and earlier)*

Article 35

1988

1988 Agricultural Research, Southeast Kansas Branch Station


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Coffey, K. P.; Moyer, J. L.; Lomas, L. W.; Sweeney, D. W.; Granade, G. V.; Walter, T.; and Kelley, K. W. (1988) "1988 Agricultural Research, Southeast Kansas Branch Station," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 8. <https://doi.org/10.4148/2378-5977.7705>

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Abstract

Research on beef cattle, crops, and related topics at Southeast Kansas Branch Station.

Keywords

beef cattle, forage, wheat, soybeans, grain sorghum

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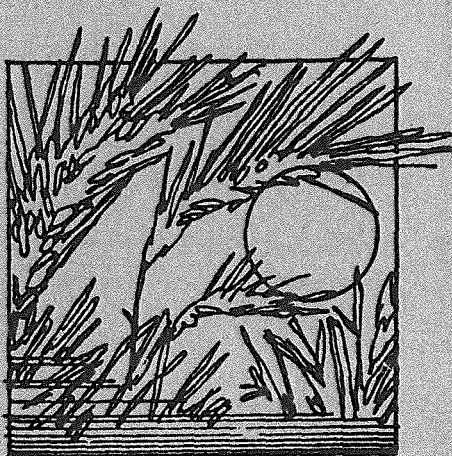
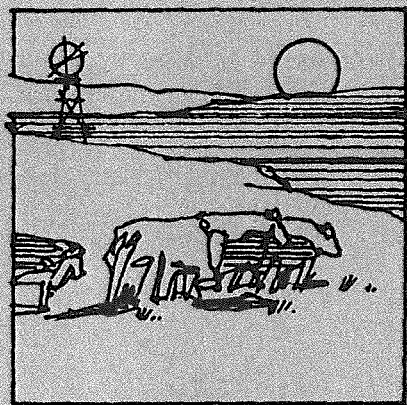


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1988 AGRICULTURAL RESEARCH



Report of
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543

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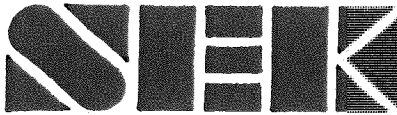
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PERFORMANCE AND GRAZING BEHAVIOR OF STEERS GRAZING
DIFFERENT FESCUE VARIETIES

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

Summary

Angus x Hereford crossbred yearling steers were grazed on pastures consisting of either high-endophyte Kentucky 31 (HE-31), HE-31 interseeded with ladino white clover (HE+LC), low-endophyte Kentucky 31 (LE-31), or Missouri 96 (M096) tall fescue for 209 days beginning on April 9, 1987. Steers grazing HE-31 had 37.4 and 39.4% lower ($P < .01$) daily gains than those grazing HE+LC and LE-31, respectively, but tended ($P > .10$) to spend more time grazing than steers in those groups. Steers grazing HE-31 grazed 49 minutes more ($P < .10$) during the night than steers grazing LE-31. Crude protein content was greater ($P < .05$) and neutral detergent fiber (NDF) content was lower ($P < .05$) from pastures of HE+LC. Neutral detergent fiber content was similar ($P > .10$) for HE-31 and LE-31, whereas crude protein content was similar ($P > .10$) for all three pasture types not containing ladino clover. Therefore, differences in performance were due to factors other than fungal effects on forage quality or grazing time.

Introduction

Presence of the endophytic fungus Acremonium coenophialum has been regarded as the major factor contributing to poor performance of animals grazing tall fescue. The mechanism whereby animal performance is reduced is still unclear. This study was conducted to evaluate the effects of the endophytic fungus on forage quality and grazing behavior and the interrelationship of these factors with performance of stocker cattle grazing tall fescue pastures.

Experimental Procedure

Forty, Angus x Hereford crossbred yearling steers (avg. wt. 500 lb.) were allotted by weight into eight replicates. Two replicates each were randomly allotted to pastures of either high-endophyte Kentucky 31 tall fescue (HE-31), low-endophyte Kentucky 31 (LE-31), HE-31 interseeded with ladino white clover (HE+LC), or Missouri 96 (M096) tall fescue. The high-endophyte fescue contained approximately 65% infestation, whereas the low-endophyte Kentucky 31 and M096 varieties contained less than 10% endophytic infestation. Steers were stocked at a rate of 1 steer per acre from April 9 until November 4. The steers were not implanted and received no supplement during the study. Replicates within a pasture type were rotated at 14-day intervals to reduce the effects of pasture variation.

Three steers were selected at random from each pasture type and fitted with clocks that recorded grazing time for a 7-day period. Grazing behavior data were collected from these steers from July 8-15 and again from September 14-21.

Wire cages (1 square meter) were randomly placed in each pasture. Forage beneath the cages was harvested on May 7, June 4, July 10, August 27, and October 19. The cages were relocated following each harvest in order to more closely estimate forage that was available to the steers since the previous sampling date.

Results

Steers that grazed LE-31 and HE+LC gained faster ($P < .01$) during the 209-day study than those grazing M096 or HE-31 (Table 1). Weight gains were similar ($P > .10$) between cattle grazing M096 and HE-31 and between cattle grazing LE-31 and HE+LC.

Grazing time was pooled within a pasture type across the July and September sampling periods. Steers that grazed M096 and HE-31 tended ($P > .10$) to graze more than those grazing LE-31 and HE+LC. Steers that grazed HE-31 spent a greater portion ($P < .10$) of their total grazing time between 10pm and 6am than steers that grazed LE-31 (18.0 vs. 10.5%; Figure 1). Grazing behavior appeared to change between the July and September measurements. Data pooled across treatments within a sampling date indicated that steers grazed less ($P < .05$; Figure 2) during the September period than during the July period and that the grazing patterns had substantially changed. In July, the greatest frequency of total grazing time (29%) occurred between 6 and 10pm and only 10% between 10pm and 6am. Conversely, in September, the greatest frequency of total grazing time (24.5%) occurred between 2 and 6pm and 18.5% occurred between 10pm and 6am. The period of 6-10am, which ranked second in July had the lowest grazing frequency during September.

Crude protein content of HE-31, LE-31, and M096 were similar ($P > .10$), with each being lower ($P < .05$) than the crude protein content of HE+LC (Figure 3). Neutral detergent fiber content (Figure 4) of HE+LC was lower ($P < .05$) than that of the other forages. Missouri 96 had lower ($P < .05$) NDF than HE-31 but was similar to LE-31.

The reason for the poor performance by cattle grazing M096 and the similarity to those grazing HE-31 is unclear. In 1986, cattle grazing the same M096 pastures gained 89 lb more than those grazing the HE-31 pastures. Forage quality and grazing behavior data do not help explain the relatively poor performance by cattle grazing M096. Cattle that performed best (LE-31 and HE+LC) spent the least amount of time grazing. Unfortunately, the grazing clocks measure time spent grazing and not grazing intensity. It is likely that cattle grazing LE-31 and HE+LC grazed more intensively. The positive effects on animal performance resulting from interseeding ladino clover into high-endophyte fescue were apparent. Ladino clover addition improved performance by 122 lb. over that of cattle grazing pure stands of high-endophyte fescue. Since cattle grazing LE-31 gained 131 lb more than those grazing HE-31, the

ladino clover apparently overcame 93% of the endophyte effects. One must keep in mind, however, that the summer of 1987 was vetter than normal and favored ladino clover production. Also, the addition of ladino clover improved the quality of the available forage.

The shift in grazing patterns between the July and the September periods appears to be related to the time of dawn and dusk. Later dawn and earlier dusk in September apparently shifted grazing to later in the morning, earlier in the evening, and then more at night.

In conclusion, fungal toxins did not affect the quality of the forage available to the cattle and did not reduce the time cattle spent grazing the high-endophyte fescue. Therefore, the decline in performance must have been due to other factors, such as a reduction in forage intake, lower nutrient utilization, or a combination of these factors.

Table 1. Weight Gain and Grazing Time by Steers Grazing High-endophyte Kentucky 31 Tall Fescue With and Without Ladino White Clover, Low-endophyte Kentucky 31 Tall Fescue, and Missouri 96 Tall Fescue

Item	HE+LC	HE-31	LE-31	M096
No. of Steers	10	10	10	10
Initial wt., lb.	500	501	500	501
Final wt., lb.	825 ^a	704 ^b	834 ^a	724 ^b
Total gain, lb.	325 ^a	203 ^b	334 ^a	223 ^b
Daily gain, lb.	1.55 ^a	.97 ^b	1.60 ^a	1.07 ^b
Total grazing time, minutes/day	564	595	569	637

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

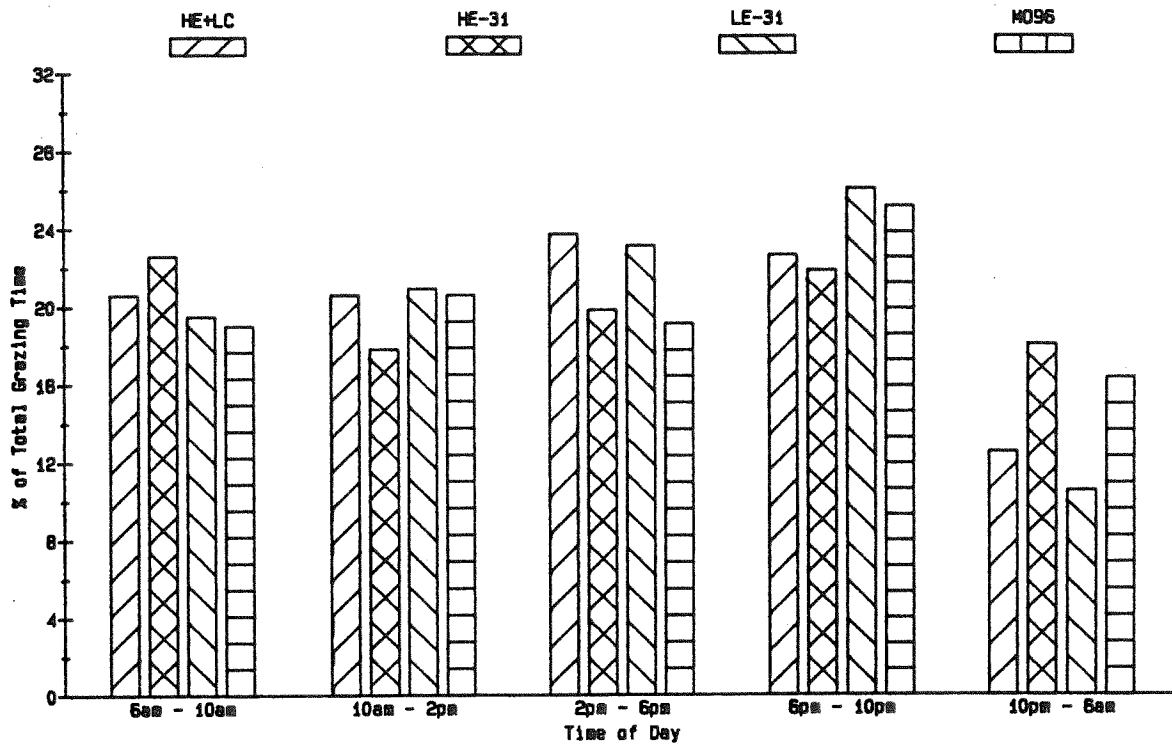


Figure 1. Proportion of Total Grazing Time Occurring at Different Time Intervals by Steers Grazing Different Fescue Varieties

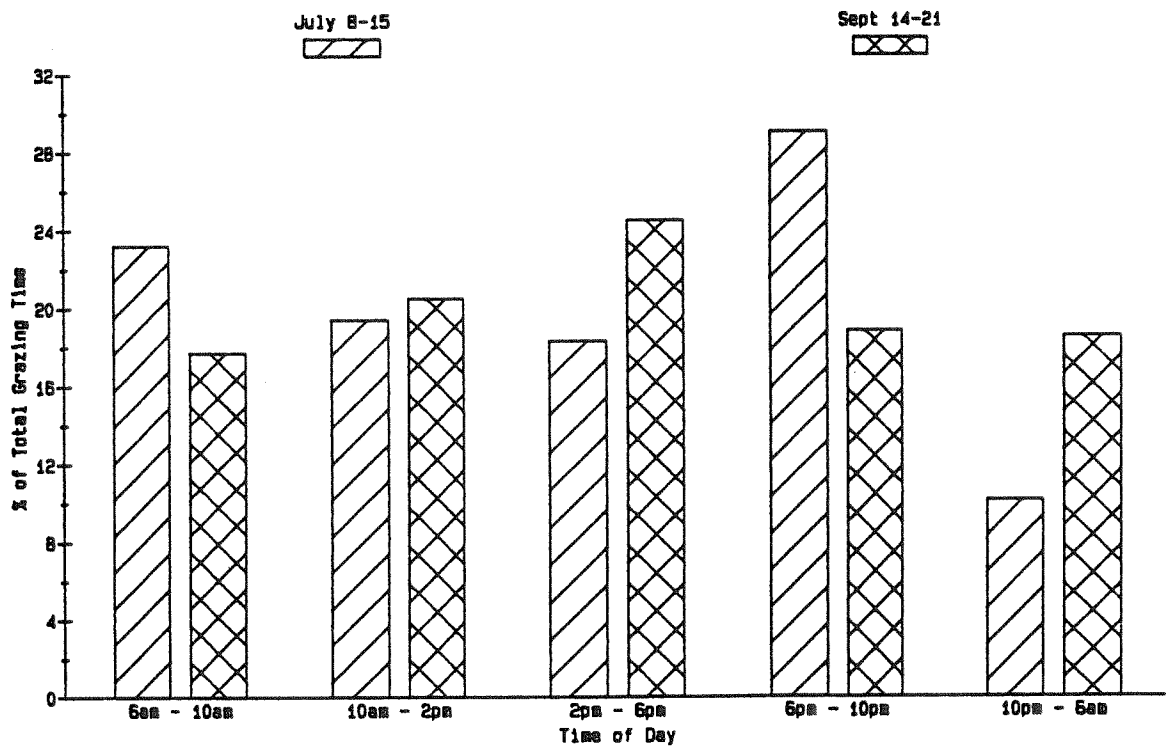


Figure 2. Seasonal Variation in the Distribution of Total Grazing Time by Steers Grazing Different Fescue Varieties

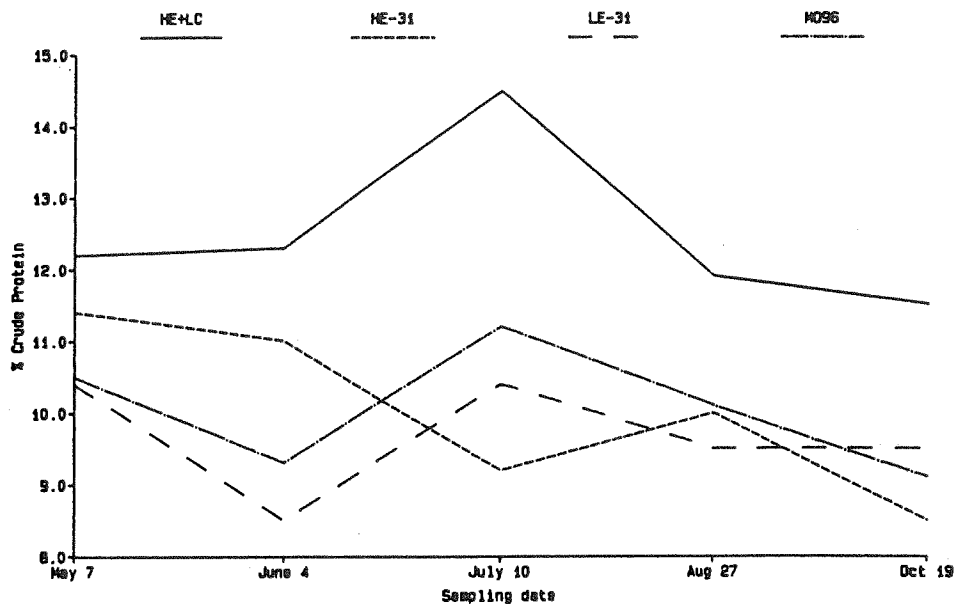


Figure 3. Crude Protein Content of Different Fescue Varieties Throughout the Grazing Season

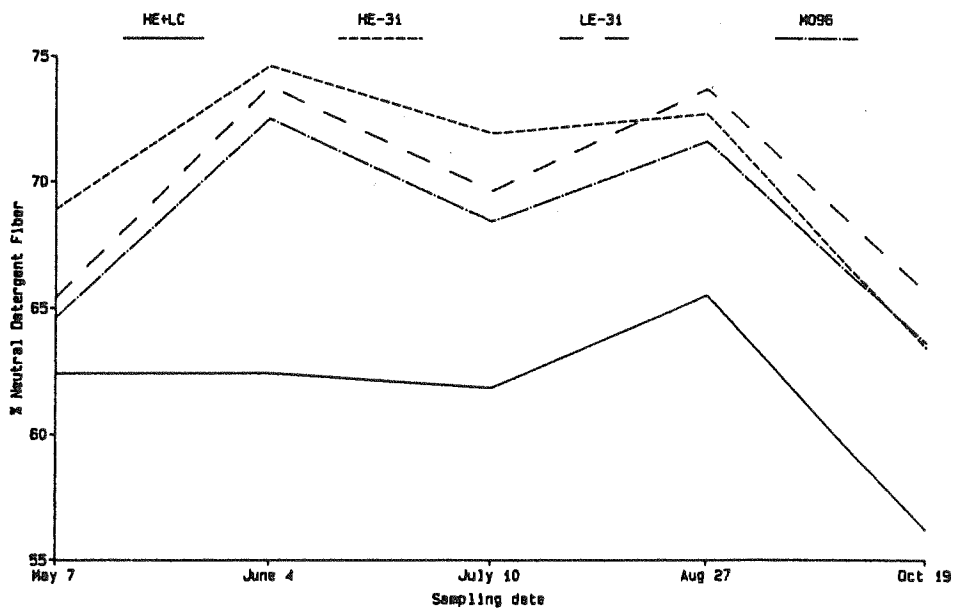
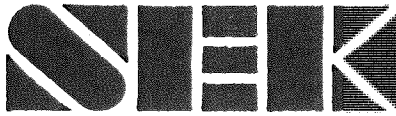


Figure 4. Neutral Detergent Fiber Content of Different Fescue Varieties Throughout the Grazing Season



SOUTHEAST KANSAS BRANCH STATION KANSAS STATE UNIVERSITY

PERFORMANCE AND GRAZING BEHAVIOR OF STOCKER STEERS THAT CONTINUOUSLY OR STRIP-GRAZED PASTURES OF FESCUE OR FESCUE INTERSEEDED WITH LADINO CLOVER

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

Summary

Eight 5-acre pastures of tall fescue or tall fescue interseeded with ladino white clover were used to evaluate steer performance and grazing behavior under continuous grazing and short-duration, intensive grazing systems. Forty-eight crossbred steers were allotted by weight into replicates of six head each. The steers either grazed fescue or fescue-ladino clover pastures continuously or were rotated through .5 acre strips at 1 to 4 day intervals. Strip-grazing negatively affected performance and grazing behavior of the steers. Live-weight gains and grazing time were reduced by 19.0 and 24.9%, respectively, by strip grazing. Interseeding ladino clover into the fescue pastures improved performance by 25.6% but did not affect grazing time. These data indicate that performance by cattle grazing fescue may be substantially improved by interseeding fescue pastures with ladino clover and substantially reduced by subdividing pastures into small strips and rotating the cattle frequently.

Introduction

Short-duration, intensive grazing has been used in other countries to improve the utilization of forage and provide a higher quality forage to grazing animals. Interest in such systems has increased in the United States in recent years, but current research has not been particularly favorable for short-duration, intensive grazing. Interseeding ladino clover into tall fescue has proved to be a beneficial management alternative, particularly when the fescue competition is controlled. The purpose of this experiment was to evaluate performance and grazing behavior of cattle that grazed fescue or fescue-ladino pastures and were managed in either a continuous grazing system or a short-duration, intensive grazing management system.

Experimental Procedure

Forty-eight crossbred Limousin steers were randomly allotted by weight into eight replicates of six head each. Each replicate was randomly assigned to one of eight 5-acre pastures that contained tall fescue (70% endophyte infestation) alone or fescue interseeded with ladino white clover. Two of the four pastures within a forage type were divided into 10 .5-acre strips using two-strand electric fences. Steers were allowed to graze for 197 days beginning on April 21. Steers allotted to the strip-grazing treatment were rotated through the .5 acre strips at 1 to 4 day intervals depending on forage growth and availability.

Three steers from each forage type and management combination were fitted with clocks that record grazing time during a 7-day period. Grazing behavior was monitored from August 10-17. Two steers that grazed fescue, one from continuous and one from strip-grazed groups, died after showing symptoms of extreme heat stress. Steer numbers in Table 1 reflect these losses.

Results

Interseeding ladino clover into pure stands of fescue appeared to be beneficial to cattle performance (Table 1). Cattle continuously grazing fescue-ladino pastures outgained those continuously grazing pure stands of fescue by 35.6% ($P < .05$), whereas cattle strip-grazing fescue-ladino gained 14.9% more ($P > .10$) than those strip-grazing pure fescue. Presence of ladino clover in the pastures did not affect grazing time.

Strip-grazing had highly adverse effects on animal performance (Table 1). Live-weight gain was reduced by 11.5% ($P > .10$) for cattle strip-grazing pure stands of fescue and by 25.0% for cattle strip-grazing fescue-ladino pastures. Strip-grazing also reduced grazing time of cattle on fescue by 29.6% and on fescue-ladino by 20.0%.

Forage type had minimal effects on grazing distribution (Figure 1). The major differences in grazing distribution occurred during the 2-6pm period. Cattle grazing fescue-ladino pastures spent 17% of their total grazing time during this period, whereas cattle grazing fescue alone spent 10% of their total grazing time then ($P < .01$). Cattle grazing fescue tended ($P > .10$) to spend a greater portion of their total grazing during the night.

Strip-grazing not only significantly affected total grazing time (Table 1) but also substantially affected the distribution of grazing time (Figure 2). Continuously grazed steers spent a greater portion of their total grazing time between 6am and 2pm than strip-grazed steers ($P < .05$). Strip-grazed steers spent 22% of the total grazing time between 10pm and 6am, whereas continuously grazed steers only spent 13% of the total grazing time during this period ($P < .01$).

Therefore, performance may suffer when cattle are grazed in a short-duration, intensive grazing system. The reasons may be a substantial reduction in grazing time and altering the normal grazing patterns of cattle. To establish a successful intensive management system, one must consider animal behavioral aspects.

Table 1. Performance and Grazing Behavior by Steers Continuously or Strip-Grazed on Fescue or Fescue Interseeded with Ladino White Clover

Item	Fescue		Fescue + Ladino	
	Cont.	Strip	Cont.	Strip
No. of steers	11	11	12	12
Initial wt., lb.	561	562	562	564
Final wt., lb.	735	716	798	741
Total gain, lb.	174 ^b	154 ^b	236 ^a	177 ^b
Daily gain, lb.	.88 ^b	.79 ^b	1.20 ^a	.90 ^b
Daily grazing time, min.	680 ^a	479 ^b	636 ^a	509 ^b

^{a, b} Means within a row with unlike superscripts differ ($P < .05$).



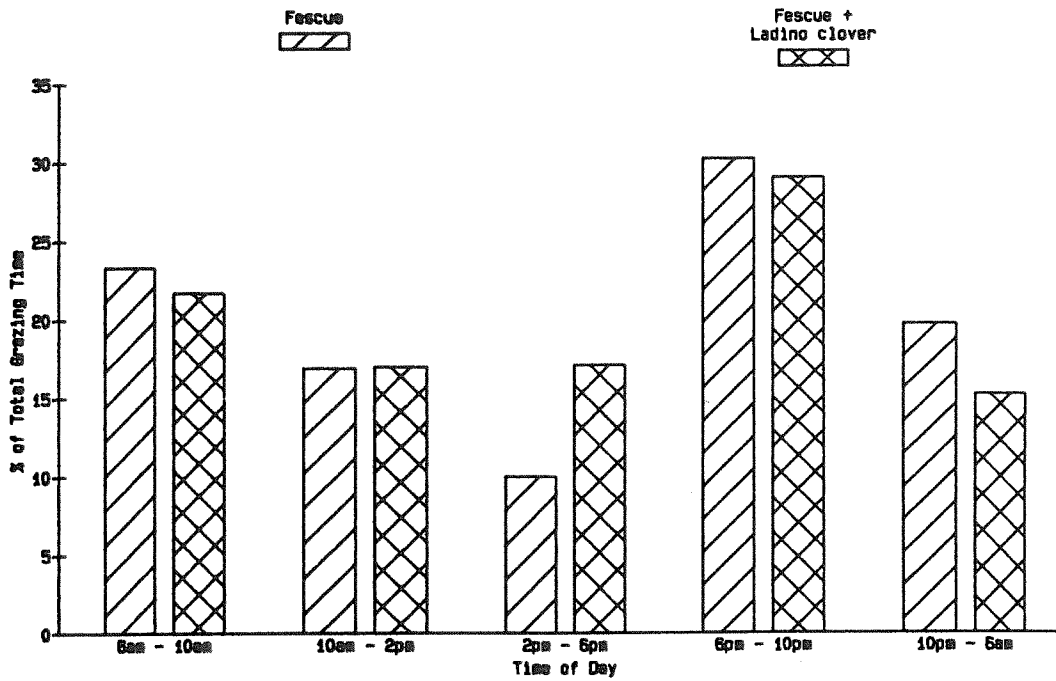


Figure 1. Proportion of Total Grazing Time Occurring at Different Time Intervals by Steers Grazing Fescue or Fescue Interseeded with Ladino White Clover

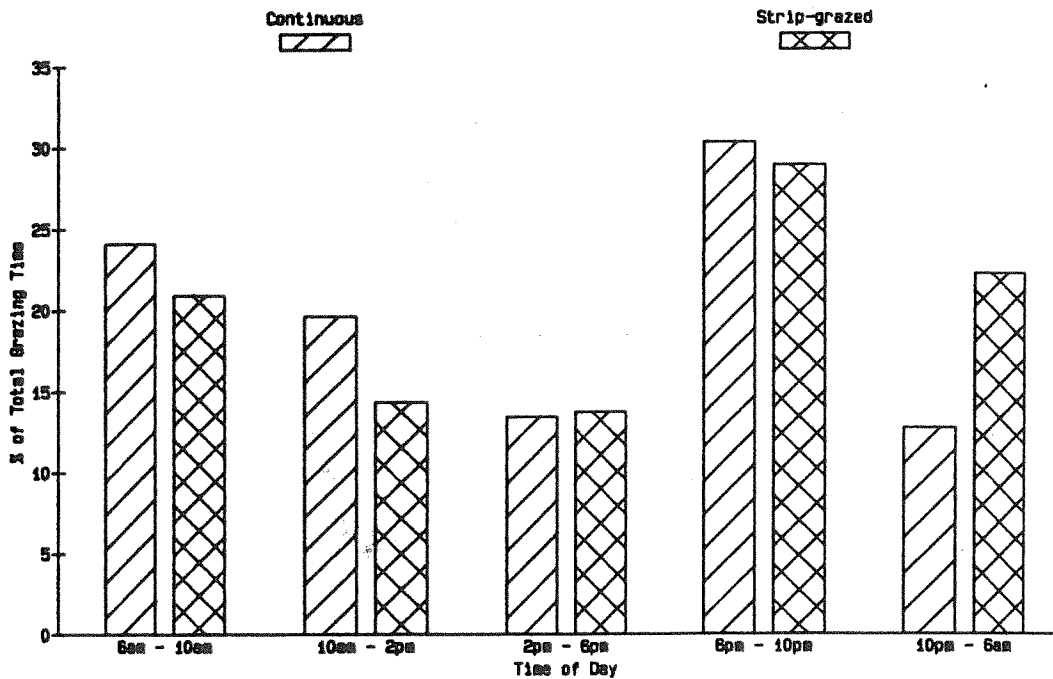


Figure 2. Proportion of Total Grazing Time Occurring at Different Time Intervals by Steers Which Were Either Continuously Grazed or Strip-grazed

FEEDLOT PERFORMANCE BY STEERS THAT PREVIOUSLY GRAZED TALL FESCUE

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

Summary

Thirty-seven crossbred steers were allotted to pastures consisting of either high-endophyte (65%) Kentucky 31 tall fescue (KY31), KY31 interseeded with ladino white clover (KY31+LC), or Missouri 96 tall fescue (M096; less than 10% endophyte infestation) for 240 days beginning on April 15. Following the grazing phase, the cattle were finished in a drylot for 134 days beginning on December 11. Cattle that previously grazed M096 began the feedlot phase 48 and 88 lb. heavier than those that grazed KY31+LC or KY31, respectively. However, these steers gained 33 and 75 lb. less in the feedlot than those previously grazed on KY31+LC and KY31, respectively. Steers that previously grazed KY31 more efficiently ($P < .10$) converted feed to gain. Quality grade and backfat were greater ($P < .05$) for steers that previously grazed KY31+LC. Therefore, cattle previously grazed on high-endophyte tall fescue appeared to compensate for weight reductions during the pasture phase when they were placed in the feedlot.

Introduction

Tall fescue is the predominant cool-season grass in southeastern Kansas. Poor summer performance by cattle grazing tall fescue has been attributed to the presence of the endophytic fungus, Acremonium coenophialum. Many producers and feedlot operators have become concerned that the fescue toxins would adversely affect cattle even after the cattle were removed from pasture. Previous research has noted a 30 - 60 day period in which feedlot cattle previously grazed on high-endophyte fescue perform slower than cattle from low-endophyte fescue. Other research has reported compensatory gains by these cattle, once they were removed from the infected fescue. The purpose of this experiment was to observe feedlot performance by cattle that previously grazed endophyte-infected tall fescue and compare their performance with that of cattle previously grazing low-endophyte fescue or high-endophyte fescue interseeded with ladino white clover.

Experimental Procedure

Thirty-seven crossbred steers were randomly allotted by weight to pastures consisting of either high endophyte (65%) Kentucky 31 tall fescue (KY31), KY31 interseeded with ladino white clover (KY31+LC), or Missouri 96 tall fescue (M096; less than 10% endophyte infection). The cattle grazed their respective pastures from April 15 through December 11, 1986. Each group of cattle was then moved to the SEKES feedlot facility at Mound Valley and

penned by replicate within the previous pasture treatment. The cattle were fed a finishing ration for 134 days, then slaughtered, and carcass data were obtained.

The finishing ration initially consisted of 30% ground grain sorghum, 6% supplement, and 64% corn silage on a dry matter basis. Grain sorghum was substituted for silage at a rate of 5% per day until reaching the final ration of 74% grain sorghum, 6% supplement and 25% corn silage on a dry matter basis. The supplement consisted of soybean meal and a commercial monensin supplement formulated to provide 24g/ton monensin in the total diet dry matter.

Results

Steers that previously grazed M096 began the feedlot phase 48 and 88 lb. heavier than those previously grazing KY31+LC and KY31, respectively (Table 1). At the end of the 134-day feeding period, the M096 cattle weighed 15 lb. more than those that previously grazed KY31-LC and 13 lb more than those that previously grazed KY31. Cattle that previously grazed KY31+LC gained 33 lb more than the cattle previously grazing M096 during the feedlot phase, so the difference in weight was less at the time of slaughter. Therefore, the cattle previously grazed on endophyte-infected tall fescue appeared to compensate for most of the weight differential. The degree of compensation appeared to be related to the suppression in pasture performance. Suppression in pasture gain of cattle grazing KY31 was more than that of cattle grazing KY31+LC and, therefore, feedlot compensation was also greater. Cattle that previously grazed KY31 also more efficiently converted feed to live-weight gain ($P < .10$).

Steers that previously grazed KY31+LC had greater backfat ($P < .10$) and quality grades ($P < .05$) and tended ($P > .10$) to have higher yield grades than those previously grazing the other forage types. Carcass characteristics of cattle previously grazed on KY31 and M096 were similar.

Overall performance data (Table 2) measured across pasture and feedlot phases showed no difference in weight from type of pasture grazed. The major concern to the cattle producer, therefore, would be comparing the cost of gain at the two phases to decide whether or not to retain ownership of the stocker cattle.

These data indicate that cattle grazing endophyte-infected tall fescue may demonstrate compensatory gain when they are placed in a feedlot and finished with a high concentrate ration. The degree of compensation may be related to the reduction in performance observed during the pasture phase. Observation of interim weights measured at 28-day intervals revealed that the cattle previously grazing high-endophyte fescue appeared to begin compensation early in the feedlot phase and continued to compensate during the entire feeding period. Therefore, considering gain and feed efficiency data, discrimination against cattle pastured on fescue is likely unwarranted.

Table 1. Effect of Pasture Type on Feedlot Performance of Steers

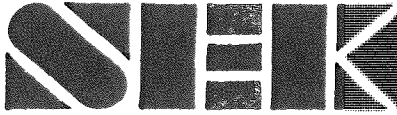
Item	KY31	KY31+LC	M096
No. of steers	12	13	12
Initial wt., lb.	633	673	721
Final wt., lb.	1140	1138	1153
Total gain, lb.	507	465	432
Daily gain, lb.	3.78	3.47	3.22
Daily dry matter intake, lb.	23.6	26.2	23.1
Feed efficiency	6.23 ^a	7.54 ^a	7.15 ^a
Hot carcass wt., lb.	674	684	677
Backfat, in.	.24 ^a	.32 ^a	.25 ^a
Ribeye area, in ²	12.9	12.5	13.0
Quality grade	Ch- ^b	Ch+ ^a	Ch- ^b
Yield grade	1.5	1.9	1.5

^a Means within a row with different superscripts differ (P<.05).

^b Means within a row with different superscripts differ (P<.10).

Table 2. Effect of Pasture Type on Overall Steer Performance
(April 15, 1986 - April 24, 1987)

Item	KY31	KY31+LC	M096
No. of steers	12	13	12
Initial wt., lb.	508	508	509
Final wt., lb.	1140	1138	1153
Total gain, lb.	632	630	644
Daily gain, lb.	1.69	1.68	1.72



PERFORMANCE OF STOCKER HEIFERS AND STEERS GRAZING HIGH-ENDOPHYTE
FESCUE AND OFFERED OXYTETRACYCLINE
IN A MINERAL MIXTURE¹

Kenneth P. Coffey and Frank K. Brazle²

Summary

Two experiments were conducted to evaluate the performance of stocker calves offered oxytetracycline in a free-choice mineral supplement. In Exp. 1, 24, yearling, crossbred heifers were utilized in a 112-day grazing study beginning on June 18. The heifers were offered ad-libitum access to either a control mineral mixture or one containing 250 mg oxytetracycline per ounce of mineral mix. Weight gains by the heifers were very low, making interpretation of performance data difficult. Consumption of the control and medicated mineral mixtures was .8 and 1.3 oz per head daily, respectively, resulting in an average oxytetracycline consumption of 327 mg per head daily. Approximately 82% of the total grazing time occurred during the daylight hours (6am - 10pm) for both treatment groups. Heifers offered the medicated mineral mix grazed 20 minutes more than heifers offered the control mineral mix. Hair scores and rectal temperatures were unaffected by oxytetracycline supplementation. In Exp. 2, 53 crossbred steers were utilized in an 83-day grazing study beginning on September 15. The steers were offered mineral mixtures similar to those used in Exp. 1. Steers offered oxytetracycline gained faster ($P < .05$) and tended to have lower ($P = .12$) rectal temperatures. Therefore, response of cattle to consumption of oxytetracycline from a mineral mixture may be variable. Heifers grazing endophyte infected tall fescue (Exp. 1) may not have gained sufficiently to support treatment differences. However, when cattle were gaining weight (Exp. 2), treatment differences were observed.

Introduction

The mode of action of the toxins in endophyte-infected fescue is currently uncertain. A number of the symptoms exhibited by cattle grazing endophyte-infected tall fescue point to a problem with their immune system. This problem may result in a reduction of the animal's ability to fight off infections. Additional antibiotics may help alleviate this condition. The purpose of this study was to determine the effect of supplemental

¹Oxytetracycline and partial financial assistance were provided by Pfizer, Inc., Lee's Summit, MO.

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oxytetracycline in a mineral mixture on performance and grazing behavior of cattle grazing endophyte-infected tall fescue.

Experimental Procedure

Exp. 1.

Twenty-four, yearling, Limousin crossbred heifers were randomly allotted by weight to four replicates of six head each. Each replicate was then randomly assigned to one of two salt mixtures, which were provided ad libitum. Two replicates received a control salt mixture and two replicates received a similar salt mixture containing oxytetracycline at a level of 250 mg/oz (Table 1). The experimental mineral mixtures were provided free-choice from covered "weather vane" type mineral feeders. The replicates were placed on four separate 7.5-acre fescue pastures (70% endophyte infestation) for a 112-day grazing study beginning on June 18.

Hair scores and rectal temperatures were measured at the beginning and end of the grazing study. Hair score was estimated on a scale of 1 to 10, where 1 is a smooth short hair coat with no long hair and 10 is a rough long hair coat with dead hair on at least 75% of the body.

Three heifers from each group of six were randomly selected for grazing behavior observations. These heifers were fitted with grazing clocks that recorded when and for how long they grazed during a 7-day period. Grazing behavior was measured from July 16-23 and Aug 18-25 with the same heifers.

Exp. 2.

Fifty-three crossbred steers (512 lb) were randomly allotted to two groups and placed on separate endophyte-infected (68%) tall fescue pastures on Sept. 15. One group received a control mineral mix and the other group received the same mineral mix containing 250 mg/oz oxytetracycline (Table 1). Mineral mixtures were offered in "weather vane" mineral feeders. Body temperatures, hair scores, and weights were measured at the initiation and termination of the 83-day grazing study.

Results

Exp. 1.

Mineral consumption (Table 2) tended to be greater ($P > .10$) when oxytetracycline was added to the mixture. Actual consumption of oxytetracycline was 327 mg/head/day, which was somewhat below the anticipated level of 400 mg/head/day.

Heifer performance was unaffected by oxytetracycline supplementation (Table 3). Heifers receiving no oxytetracycline in the mineral mixture actually gained .15 lb/day more ($P > .10$) than those receiving oxytetracycline. However, these differences are trivial considering the low total gain for the study. At gains of this magnitude, small differences are more likely due to variability in response of the animals allotted to treatments. Although

differences in grazing time were not statistically different ($P > .10$), heifers offered oxytetracycline in the mineral mix tended to graze more (Table 3). Approximately one-third of the total grazing time occurred between 6 and 10 pm for both groups (Figure 1). Proportions of the daylight grazing time occurring at the other 4-hour increments were similar between treatments.

Although final temperatures were similar between treatments, heifers consuming oxytetracycline tended to show a greater reduction between the initial and final temperatures. Unfortunately, heifers allotted to the oxytetracycline treatment groups had greater initial hair scores ($P < .01$). Final hair scores were similar ($P > .10$), resulting in a tendency for a lower magnitude of increase in hair score from heifers offered oxytetracycline.

Exp. 2.

Mineral consumption tended to be greater ($P > .10$) when oxytetracycline was not included (Table 5). Average oxytetracycline consumption was 600 mg/head/d. Steers consuming the medicated mineral mixture gained 26.5% faster ($P < .05$) and tended to have lower rectal temperatures ($P = .12$) than steers consuming non-medicated mineral (Table 6). Hair scores were not affected by the addition of oxytetracycline to the mineral mix.

Conclusions

In conclusion, oxytetracycline had little effect on the heifers grazing tall fescue in Exp. 1. Much of the reason may be the generally poor performance by all heifers. One possible solution to the problem would have been to initiate the study earlier in the grazing season to take advantage of the spring growth of fescue. Another might have been to hand feed the oxytetracycline in a carrier of ground corn or grain sorghum. During the fall grazing experiment (Exp. 2), gains were adequate, and treatment differences were apparent. Therefore, oxytetracycline supplementation in a free-choice mineral mixture may offset some of the performance reduction observed for cattle grazing endophyte-infected tall fescue. However, this response may only be observed in cattle that are in a weight gaining status.

Table 1. Composition of Mineral Mixtures Offered to Cattle Grazing Tall Fescue Pastures in Experiments 1 and 2.

Ingredient	Control	Medicated
	%	
Trace mineralized salt	33	30
White salt	29	27
Dicalcium phosphate	27	25
Soybean meal	11	10
Terramycin 50	0	8

Table 2. Mineral Consumption by Exp. 1 Heifers Grazing Tall Fescue Pastures.

Item	Control	Medicated
Mineral consumption, oz./head/day	.8	1.3
Oxytetracycline consumption, mg/head/day	0	327

Table 3. Performance and Grazing Time by Exp. 1 Heifers Grazing Tall Fescue Pastures and Offered Oxytetracycline in a Mineral Mix.^a

Item	Control	Medicated
Initial wt., lb	729	730
Final wt., lb	750	734
Total gain, lb	21	4
Daily gain, lb	.19	.04
Daily grazing time, min	528	540

^aNo statistically significant (P<.10) differences observed.

Table 4. Temperature and Hair Score of Exp. 1 Heifers Grazing Tall Fescue Pastures and Offered Oxytetracycline in a Mineral Mix.

Item	Control	Medicated
Initial temp., °F	102.6	103.1
Final temp., °F	102.5	102.7
Temp. difference, °F	-.1	-.4
Initial hair score	3.2 ^a	3.9 ^b
Final hair score	5.8	5.8
Hair score difference	2.6	1.9

a. ^bMeans within a row with unlike superscripts differ (P<.01).

Table 5. Mineral Consumption by Exp. 2 Steers Grazing Tall Fescue Pastures.

Item	Control	Medicated
Mineral consumption, oz/head/d	3.1	2.4
Oxytetracycline consumption mg/head/day	0	600

Table 6. Performance of Exp. 2 Steers Grazing Tall Fescue and Offered Oxytetracycline in a Mineral Mixture.

Item	Control	Medicated
No. of steers	25	28
Initial weight, lb.	518	508
Final weight, lb.	599	611
Total gain, lb.	81	103
Daily gain, lb.	.98 ^b	1.24 ^a
Final hair score	5.7	5.7
Rectal temperature, °F	103.3	103.1

^{a, b} Means within a row with unlike superscripts differ (P<.05).

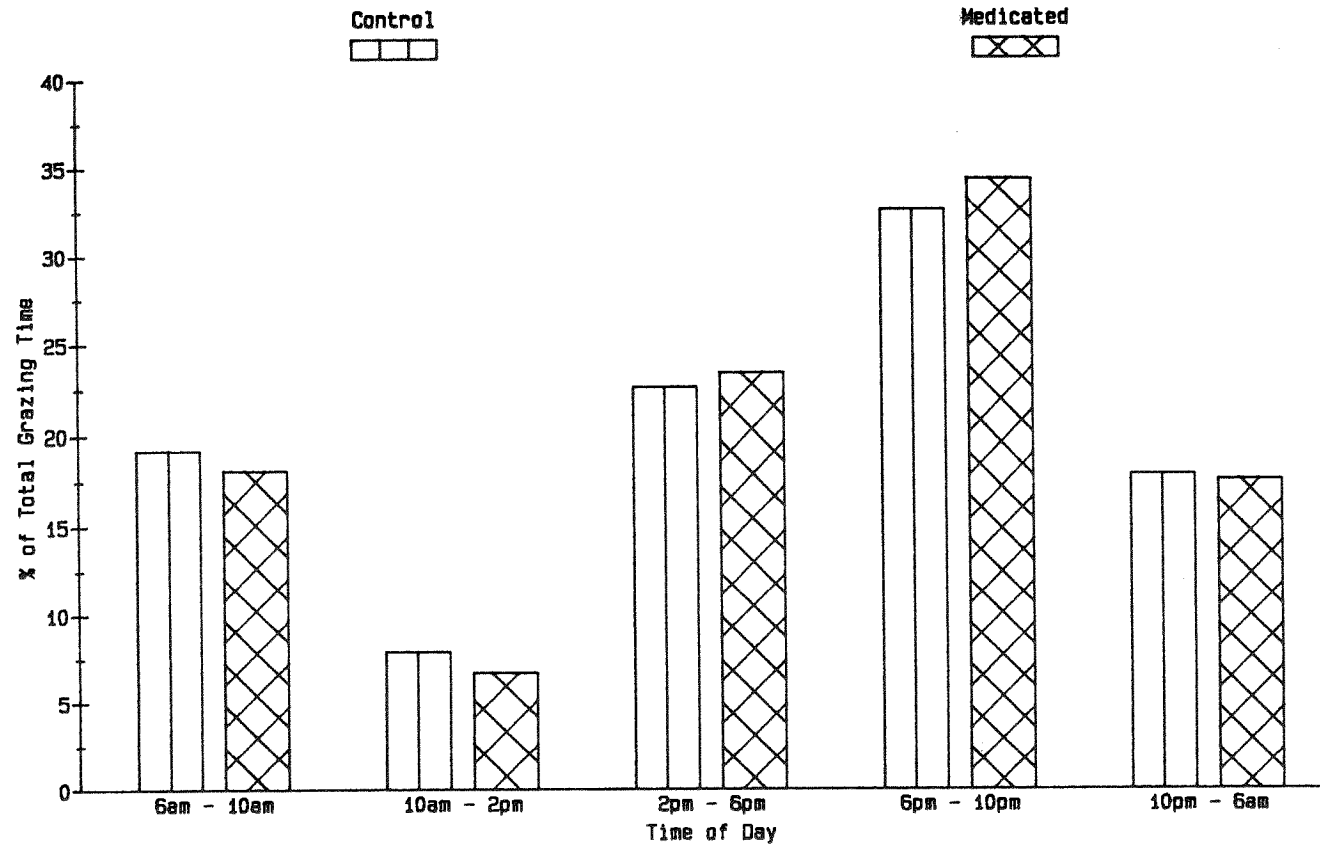


Figure 1. Proportion of Total Grazing Time Occurring at Different Time Intervals by Heifers Offered Mineral Mixtures With and Without Oxytetracycline



PERFORMANCE OF STOCKER HEIFERS GRAZING BERMUDAGRASS
AND OFFERED SUPPLEMENTS CONTAINING FEATHER MEAL

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

Summary

Limousin crossbred heifers were divided into eight replicates by weight and randomly allotted to eight 5-acre bermudagrass pastures. Heifers were offered daily supplements of ground milo (M), feather meal + milo (FM), soybean meal (SBM), or feather meal + soybean meal + milo (FM-SBM) during a 126-day grazing study, which began on June 18. Equal quantities of energy were provided daily from each supplement, and equal quantities of protein were supplied daily from all but M. Supplementation with protein sources increased ($P < .10$) performance over that of heifers receiving milo alone (M). Heifers offered supplements containing feather meal (FM and FM-SBM) performed similarly to those offered SBM. Therefore, feather meal may be used in a supplement for grazing cattle without affecting performance.

Introduction

Feather meal is a byproduct of the poultry industry made by subjecting chicken feathers to high pressure and steam. Feather meal is very high in protein (85-90%) but has only 83% of the energy level found in soybean meal. The protein in feather meal has high rumen escape or "by-pass" value. Because of the location of numerous poultry processing plants within a 150 mile radius, feather meal offers the potential to help meet the protein needs for cattle in the Southeast Kansas area. The purpose of this study was to evaluate feather meal as a protein source for stocker heifers grazing bermudagrass.

Experimental Procedure

Fifty-six, crossbred Limousin heifers (avg. wt. 636 lb.) were divided by weight into eight replicates, with each replicate randomly assigned to one of eight 5-acre bermudagrass pastures. Four daily supplements shown in Table 1 were each offered to two replicates of heifers. Supplement formulation (Table 1) and level per day (Table 2) were balanced so that each supplement provided the same quantity of energy, and the three supplements containing protein sources provided the same quantity of protein and energy daily. Cattle were rotated through the eight pastures at 14-day intervals to minimize the effects of pasture variation. Mineral blocks were provided ad-libitum. Two heifers calved during the study. Their data were not used in any parameter listed.

Results

Addition of protein sources to the supplements improved performance by an average of 14.6% over the control supplement ($P < .10$). Heifers offered the supplements with different protein sources performed similarly ($P > .10$). Supplementation with a mixture of milo and feather meal resulted in performance similar ($P > .10$) to that from supplementation with soybean meal only. Milo addition to the feather meal was necessary to maintain equal energy consumption of the supplements.

Initial acceptance of FM was poor. Dried molasses was added to the mixture daily for the first week of the study to encourage consumption. Thereafter, the molasses was removed and consumption was not limited. A similar problem was not observed with the FM-SBM supplement.

The major advantage to the supplements with feather meal was the cost. The extremely high protein content allows dilution with cheaper grain to balance the protein and energy with that of soybean meal. The cost of feather meal is typically very erratic. Feather meal used in this study was purchased for \$230/ton but had been earlier quoted at \$300/ton. Therefore, before utilizing feather meal in a supplement, one should consider its cost plus the cost of grain, then compare this with the cost of soybean meal.

Table 1. Composition of Supplements Offered to Stocker Heifers Grazing Bermudagrass Pastures

Ingredient	Control	SBM	FM	FM-SBM
	----- % -----			
Grain sorghum	100		62.5	36.3
Soybean meal	0	100	0	41.9
Feather meal	0	0	37.5	21.8

Table 2. Daily Supplement Consumption by Stocker Heifers Grazing Bermudagrass

Ingredient	Control	SBM	FM	FM-SBM
	----- lb/day -----			
Grain sorghum, lb.	.75	-	.65	.32
Soybean meal, lb.	-	.75	-	.38
Feather meal, lb.	-	-	.39	.20
Total consumption, lb.	.75	.75	1.04	.90
Daily supplement cost, cents/head ^a	2.25	8.55	6.44	7.59

^aBased on the following prices:
 milo @ \$ 3.00/cwt.
 feather meal @ \$ 11.50/cwt.
 soybean meal @ \$ 11.40/cwt.

Table 3. Performance of Stocker Heifers Offered Different Supplements while Grazing Bermudagrass

Item	Control	SBM	FM	FM-SBM
No. heifers	14	13	13	14
Initial wt., lb.	636	633	631	642
Final wt., lb.	724	735	732	741
Total gain, lb. ^a	88	103	101	99
Daily gain, lb. ^a	.70	.82	.80	.79

^aControl differed from the mean of the other supplements ($P < .10$).





DOSE-RESPONSE RELATIONSHIP OF THE COMPOUND
TETRONASIN IN CATTLE ON PASTURE¹

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

Summary

One hundred stocker steers were utilized in a 112-day grazing experiment to determine the optimum-response dose of tetroneasin for grazing cattle. Following a 12-day adaptation to pasture and 2 lbs of ground corn per head daily, the steers were randomly assigned to levels of either 0, 15, 30, 60 or 90 mg tetroneasin per head daily blended in a carrier of 2 lbs of ground corn. Live-weight gain by steers increased as the level of tetroneasin increased. Steer live-weight gains were improved by 3.6, 3.6, 8.6, and 17.9% by the 15, 30, 60, and 90 mg doses, respectively. No adverse effects were observed from steers consuming tetroneasin. Therefore, tetroneasin appears to be an acceptable feed additive, which could improve gains by grazing steers.

Introduction

Tetroneasin is an experimental feed additive, which has been shown to improve feed efficiency of feedlot cattle. Tetroneasin is classified with a group of compounds called ionophores, which includes monensin and lasalocid. Data concerning the optimum dose of tetroneasin for grazing stocker cattle are very limited. The purpose of this study was to determine the effective dose range of tetroneasin that would produce maximum gains by stocker cattle grazing smooth bromegrass pastures.

Experimental Procedures

A total of 100 crossbred steers were utilized in a 112-day grazing study beginning on April 30. The cattle were dewormed and given clostridial, IBR, PI, and BVD vaccinations upon arrival and vaccinated against Moraxella bovis (Pinkeye) on May 28. Following preliminary processing procedures, the steers were randomly divided into groups and offered 2 lbs of ground corn per head daily during a 12-day acclimation period. Following this period, the steers were divided into light and heavy replicates. Within a replicate, the steers were randomly allotted by weight and breed to five lots of 10 steers. Each lot received either 0, 15, 30, 60, or 90 mg of tetroneasin per head daily in a 2 lb ground corn carrier.

¹Supplemental tetroneasin, vaccines and partial financial assistance were provided by Cooper's Animal Health, Kansas City, MO.

Steers were allowed to graze one of 10 10-acre smooth bromegrass pastures. Cattle were rotated through the pastures approximately every 14 days to minimize the effects of pasture variation.

Results

Live-weight response to increasing levels of tetronasin is shown in Table 1. In this study, steers continued to increase in weight with each additional level of tetronasin greater than 30 mg/head/day. Improvements in live-weight gain over that of steers receiving no tetronasin ranged from 3.6% with 15 and 30 mg/head/day to 17.9% with 90 mg/head/day. The responses indicate that tetronasin is effective in improving live-weight gain by steers grazing spring and summer pastures and that the dose range of 60 - 90 mg per head daily may be optimum for improving cattle performance.

Table 1. Response of Steers to Various Levels of Tetronasin

Item	Level of Tetronasin, mg/hd/day				
	0	15	30	60	90
Initial wt., lb.	670	670	672	669	671
Final wt., lb.	810	815	817	821	836
Total gain, lb.	140	145	145	152	165
Daily gain, lb.	1.25	1.29	1.29	1.36	1.47



CONSUMPTION OF LASALOCID IN HARDENED MOLASSES SUPPLEMENTS
FED FREE-CHOICE TO STOCKER CATTLE*

Kenneth P. Coffey and Lyle W. Lomas

Summary

Two experiments were conducted to evaluate consumption of lasalocid from hardened molasses block supplements. In Exp. 1, 72 crossbred steers were offered no supplement or a heat processed molasses supplement with or without lasalocid at a level of 200 mg per pound of supplement. Steers were allowed to graze winter fescue pastures for a 98-d period beginning on December 3 and offered ad-libitum access to fescue-bromegrass hay. Total gain by steers offered molasses blocks with lasalocid was 14.9 lb greater ($P < .10$) than gain by steers offered the blocks without lasalocid. Steers offered molasses blocks with lasalocid consumed .3 lb more ($P < .10$) supplement per day than those offered supplement without lasalocid. Average lasalocid consumption was 222 mg/head/day. In Exp. 2, 24 yearling steers were used to measure consumption of lasalocid from chemically hardened molasses blocks. Lasalocid was included in the blocks at a level of 100 mg per pound of supplement. Average consumption of the blocks with lasalocid was 3.62 lb/head/day, resulting in lasalocid intake of 362 mg/head/day, which is far in excess of legally acceptable levels. These data indicate that incorporation of lasalocid into hardened molasses supplements may stimulate supplement consumption. Therefore, lasalocid intake may be underestimated if standard consumption estimates are used in the initial block formulation.

Introduction

Lasalocid is a commercially available feed additive used to alter rumen fermentation to improve feed efficiency and rate of gain. Lasalocid is presently approved for consumption by grazing cattle at levels of 60 - 200 mg per head daily. Before lasalocid may be included in free choice supplements, consumption of the supplement must be monitored to ensure that lasalocid intake falls within acceptable levels. Molasses blocks appear to be a popular delivery device for lasalocid. These blocks have the advantage of providing lasalocid along with supplemental energy in a form that is convenient for most producers to feed. The purpose of these studies was to evaluate consumption of hardened molasses cattle blocks containing lasalocid to determine if lasalocid intake was within federally regulated levels and to measure resulting cattle performance.

*Molasses blocks and partial financial assistance for Exp.2 were provided by Cargill, Inc., Elk River, MN 55330.

Experimental Procedures

Exp. 1.

Seventy-two crossbred steers (avg. wt. 527 lb) were randomly assigned to one of eight tall fescue pastures and rotated at 14-day intervals to minimize the effect of pasture variation. All cattle were allowed access to non-medicated, heat-processed, molasses blocks containing molasses solids, fat, protein, minerals, and vitamins during a 14-day adaptation period. The steers were then grouped by body weight and randomly assigned to one of eight lots of nine steers each. The lots were randomly divided such that three lots received molasses blocks containing 200 mg/lb lasalocid, three received non-medicated molasses blocks, and two lots received no supplement during a 98-day winter grazing study beginning on December 3. Steers receiving supplementation were allowed ad libitum access to barrels containing the molasses supplements. Fescue-bromegrass hay, water, and commercial mineral blocks were provided ad libitum to each lot of cattle.

Exp. 2.

Twenty-four crossbred steers (avg. wt. 675 lbs) were allowed a 2-week period of adaptation to chemically hardened molasses blocks containing no lasalocid. The steers were then divided by weight into three replicates. Each replicate was allotted to one of three 5-acre bermudagrass pastures for a 63-day grazing study beginning on June 15. The steers were rotated through the three pastures at 14-day intervals to minimize the effects of pasture variation. Each replicate of steers received ad libitum access to commercial, chemically hardened molasses, cattle blocks containing 100 mg lasalocid per lb of block. Water and commercial mineral blocks were provided ad-libitum.

Results

Exp. 1.

Total gain and average daily gain by steers offered the heat-processed, molasses block with lasalocid were 50.6% greater ($P < .10$) than gains of those offered non-medicated molasses blocks (Table 1). Steers offered no supplement gained 10.9% less ($P > .25$) than those offered supplement with lasalocid but gained 36.0% more ($P = .22$) than those offered non-medicated supplement.

Block consumption was greater ($P < .10$) by steers offered supplemental molasses blocks with lasalocid (Table 1). Average medicated block consumption was 1.11 lb/head/day or 222 mg of lasalocid/head/day.

The results of Exp. 1 were perplexing, especially the low performance of the steers offered non-medicated molasses blocks. The small amount of supplemental energy (.80 lb) consumed by this group should not have suppressed forage intake and thereby reduced performance below that of control steers. Furthermore, the extra .3 lb consumed by the steers offered supplement with lasalocid should not have resulted in the .15 lb greater daily gain from those steers. Likewise, it is unlikely that the 222 mg of

lasalocid per day would create such a response. The most probable cause of the erratic data is the level of performance the steers attained. With low weight gains, such as observed in this experiment, treatment responses are typically erratic.

Exp. 2.

Average consumption of the chemically hardened molasses blocks across the three replicates for the 63-day study was 3.62 lb/head/day. Average consumption was above 2 lb/head/day from week 2 until early termination at 63 days and steadily increased throughout the study. Numerous trials had established consumption of the chemically hardened molasses blocks without lasalocid at approximately 1.5 - 2.0 lb/head/day. The reason for the excessive consumption of medicated blocks is unknown. Forage was not limiting in any of the three pastures.

Average lasalocid intake was 362 mg per head daily, which is far in excess of federal regulations. No adverse health effects were noted, but gains were somewhat less than might be expected from cattle receiving 3.6 lb of energy supplement while grazing bermudagrass in the summer months.

These data indicate that consumption of hardened molasses blocks may be increased with the addition of lasalocid. However, performance by stocker steers may not be improved by use of hardened molasses supplements.

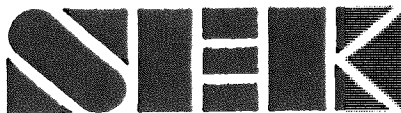
Table 1. Weight Gain and Consumption of a Heat-Processed Molasses Supplement With and Without Lasalocid by Steers Grazing Winter Fescue Pasture - Exp. 1.

Item	Treatment		
	No Supplement	Molasses Blocks	
		Without Lasalocid	With Lasalocid
No. Steers	18	27	27
Initial wt., lb.	527	527	527
Final wt., lb.	567	556	571
Total gain, lb.	40 ^{a,b}	29 ^b	44 ^a
Daily gain, lb.	.41 ^{a,b}	.30 ^b	.45 ^a
Total consumption, lb.		703 ^b	978 ^a
Daily consumption, lb.		.80 ^b	1.11 ^a

^{a,b} Means within a row followed by unlike superscripts differ (P<.10).

Table 2. Weight Gain and Consumption of a Chemically Hardened Molasses Supplement With Lasalocid by Steers Grazing Bermudagrass - Exp. 2.

Item	Lot X	Lot Y	Lot Z	Mean
Initial wt., lb.	675	678	673	675
Final wt., lb.	729	744	715	729
Total gain, lb.	54	66	42	54
Daily gain, lb.				
6/16 - 7/14	1.03	1.75	.96	1.25
7/14 - 8/18	.74	.51	.43	.56
Mean daily gain, lb.	.86	1.05	.67	.86
Consumption, lb/day				
6/16 - 7/14	2.43	2.97	2.82	2.74
7/14 - 8/18	3.89	4.29	4.82	4.33
Mean daily consumption, lb.	3.24	3.70	3.93	3.62



FEEDLOT PERFORMANCE OF STEERS FED SPROUT-DAMAGED MILO

Kenneth P. Coffey and Lyle W. Lomas

Summary

Forty-eight, Charolais crossbred steers were fed sprouted and non-sprouted milo for 139 days in a finishing study. Steers fed sprouted milo were 28 lb. heavier ($P < .10$) and gained 8.4 % faster ($P < .10$) while consuming 2.7 % less ($P > .10$) feed per pound of gain produced. Sprout-damaged milo had no significant effect ($P > .10$) on carcass characteristics. These data indicate that cattle fed sprouted milo should perform as well or better than those fed non-sprouted milo.

Introduction

Excessive rain and flooding in Southeast Kansas in the fall of 1986 caused considerable damage to unharvested milo. Much of the milo grain sprouted while still contained in the head. Grain dealers substantially reduced payment for sprouted milo, resulting in an immense economic loss to area milo producers. Many producers chose to feed the milo rather than take the price reduction at the grain elevator. Such decisions stimulated many questions concerning the feeding value of the sprouted grain. This project was conducted to answer some of these questions.

Experimental Procedure

Forty-eight, Charolais crossbred steers were randomly allotted by weight into six pens, each containing eight head. The pens then were assigned randomly to receive finishing diets containing sprouted or unsprouted milo, both of which were Hogemeyer 688 red milo. The sprouted milo contained 51% sprout-damaged kernels. Both diets consisted of 74% milo, 20% corn silage, and 6% supplement on a dry matter basis. The supplement consisted of soybean meal and a commercial monensin supplement formulated to provide 22.5 g/ton monensin in the complete diet. All steers were dewormed; implanted with Ralgro; vaccinated for IBR, PI, Vibrio, Lepto 5, and 7-way blackleg; and then offered the respective diets for 139 days. At the end of the feeding period, the cattle were slaughtered, and carcass data were obtained.

Results

Steers fed sprouted milo gained 28 lb. more ($P < .10$) and 8.4% faster ($P < .10$) than those fed unsprouted milo (Table 1). Quality grade, yield grade, and backfat of steers fed sprouted milo tended to be greater ($P < .10$) than those of steers fed unsprouted milo. Steers fed sprouted milo consumed 5.3%

more feed than those fed unsprouted milo but required 2.7% less feed per pound of gain produced. Feedlot performance of steers fed both types of milo in this study were lower than expected. Much of the reduced performance may be attributed to extremely muddy conditions in the feedlot during the experiment.

These data indicate that sprout-damaged milo is as an acceptable feed source for finishing cattle. However, grain quality should still be considered. The milo used in this study had a test weight greater than 60 lb/bu, even though it had sprouted. Also, the sprouting damage (51%) was not as severe as in some instances. Therefore, projecting what might occur if cattle were fed milo with greater sprout-damage or lower test weights is not possible from this study. These factors should be considered when purchasing grain.

Table 1. Feedlot Performance and Carcass Characteristics of Steers Offered Sprouted and Unsprouted Milo in a Finishing Ration.

Item	Sprouted	Unsprouted
No. Steers	24	24
Initial wt., lb.	828	829
Final wt., lb.	1206 ^a	1178 ^b
Total gain, lb.	378 ^a	350 ^b
Daily gain, lb.	2.72 ^a	2.51 ^b
Daily Feed DM intake, lb.	24.29	23.06
Daily Feed DM/gain	8.93	9.18
Hot carcass wt., lb.	730	718
Dressing %	60.5	60.9
Quality grade ^c	11.1	10.5
Backfat, in.	.37	.33
Ribeye area, in ²	13.1	13.6
Yield grade	2.0	1.7

^{a, b}Means within the same row with unlike superscripts differ (P<.10).

^cLow choice = 10; Average choice = 11, etc.



CORN + OATS VERSUS MILO + OATS AS CREEP FEED FOR SUCKLING CALVES

Lyle W. Lomas and Kenneth P. Coffey

Summary

Daily gains and creep feed consumption of fall-dropped calves fed a mixture of 2/3 oats and 1/3 corn or a mixture of 2/3 oats and 1/3 milo were compared. Gains were similar for calves fed the two creep rations. Calves fed oats + milo consumed 53% more feed than those fed oats + corn.

Introduction

Creep feeding usually increases weaning weights of beef calves by 40 to 80 lb. Greatest response to creep feeding is obtained with fall calves or calves born to cows that are poor milkers or when forage availability for the cowherd is limiting. Cost of creep feed, feeder-calf prices, and age when calves are to be marketed determine the profitability of creep feeding. Corn is usually the energy source of choice because it is thought to be more palatable than milo. The performance of fall-dropped calves creep fed a mixture of 2/3 oats and 1/3 corn or 2/3 oats and 1/3 milo were compared in this study.

Experimental Procedure

Twenty-two, fall dropped, Simmental, Simmental x Angus, and Angus calves (12 steers and 10 heifers) were allotted equally by weight, sex, and breed to two groups on November 24, 1986, and all steer calves were implanted with Ralgro^(®). One group was creep fed a mixture of 2/3 oats and 1/3 corn, whereas the other group was creep fed a mixture of 2/3 oats and 1/3 milo. Oats and corn were coarsely ground and milo was finely ground. Each group of calves and their respective dams were wintered on 15-acre Kentucky 31 fescue pastures and fed big round bales of mixed grass hay ad libitum. Calves were weaned on April 9, 1987 (134 days), when they were approximately 6 months old.

Results

Results of this study are presented in Table 1. Average daily gains of calves creep fed corn + oats and milo + oats were 2.21 and 2.41 lb per head, respectively. These gains were not statistically different ($P=.13$). Average daily consumption of corn + oats and milo + oats were 4.77 and 7.31 lb per head, respectively. Although calves creep fed milo + oats consumed 53% more creep feed, gains were similar to those creep fed corn + oats. Gains and creep feed consumption of calves creep fed corn + oats were similar to those obtained in previous years for calves fed the same ration.

Table 1. Corn + Oats vs. Milo + Oats as Creep Rations (134 days).

<u>Item</u>	<u>Oats + Oats</u>	<u>Milo + Oats</u>
No. of calves	11	11
Initial wt., lb	244	244
Final wt., lb	540	566
Total gain, lb	296	322
Average daily gain, lb	2.21	2.41
Average daily creep feed intake, lb	4.77	7.31





INOCULANT-TREATED CORN SILAGE FOR GROWING STEERS AND HEIFERS

Lyle W. Lomas and Kenneth P. Coffey

Summary

Twenty-four steer and 24 heifer calves were equally divided within sex into four groups of six head each and fed corn silage for 80 days. Two pens of heifers and two pens of steers were fed corn silage treated with a microbial inoculant (Garst M-74 Plus[®]) applied at the time of ensiling and two pens of steers and two pens of heifers were fed untreated, control silage. Inoculated and control silages resulted in similar cattle performance and dry matter recovery from the silo.

Introduction

Application of microbial inoculants to fresh, whole-plant material at the time of ensiling usually reduces dry matter losses during the fermentation process. However, these additives have not resulted in consistent improvements in cattle performance.

Experimental Procedure

Corn silage treated with Garst M-74 Plus[®] inoculant at the time of ensiling was compared to control silage that contained no additives. Both were whole-plant silages harvested in the mid-dent stage on July 24, 25, and 26, 1986 from Garst 8315 hybrid corn and stored in 16 x 50 ft concrete stave silos. Garst M-74 Plus[®] inoculant was applied at the blower at the time of ensiling at the manufacturer's recommended rate. Silos were opened on September 11, 1986 and emptied at a uniform rate during the next 44 weeks. Samples were taken on a regular basis to determine dry matter recovery.

Each silage was fed to 24 steer and 24 heifer calves (two pens of each sex per silage) in an 80-day growing trial, which began on May 5, 1987. Rations containing 88.0% corn silage and 12.0% supplement on a DM basis were fed ad libitum. Each ration was formulated to provide 12.5% crude protein (DM basis), 22.5 g of monensin per ton of ration DM, and equal amounts of calcium, phosphorous, and vitamins A, D, and E. Silage and supplement were mixed in a feed wagon and fed as complete mixed rations. Feed offered was recorded daily for each pen. Feed not consumed was removed, weighed, and discarded.

All cattle were fed supplemented control silage ad libitum for 11 days prior to the start of the feeding trial. At the beginning of the growing study, all cattle were dewormed with fenbendazole, and steers were implanted with Ralgro^(®). Initial and final weights were each the average of full weights taken on 2 consecutive days. This study was terminated on July 24, 1987 (80 days).

Results

A summary of growing cattle performance is listed in Table 1. Since there were no significant interactions, sex of cattle was pooled within silage treatments, and silage treatments were pooled within sex of cattle. Performance was similar between cattle fed the control and inoculated silages. Dry matter recovery and cattle gain produced per ton of crop ensiled were similar for the control and inoculated silages.

Table 1. Effect of Treating Corn Silage with Garst N-74 Plus^(®) Inoculant on Performance of Growing Steers and Heifers (80 days).

Item	Silage Treatment		Sex	
	Control	Inoculated	Steers	Heifers
No. of cattle	24	24	24	24
Initial wt., lb	536	537	572 ^a	501 ^b
Final wt., lb	786	782	840 ^a	727 ^b
Total gain, lb	250	245	268 ^a	226 ^b
Average daily gain, lb	3.12	3.06	3.35 ^a	2.83 ^b
Daily feed intake, lb ¹	15.26	15.25	16.35 ^a	14.16 ^d
Silage, lb	13.43	13.42	14.39	12.46
Supplement, lb	1.83	1.83	1.96	1.70
Feed/gain ¹	4.89	4.99	4.87	5.00
<hr/>				
Silage fed, lb/ton ensiled ²	1641	1594		
Silage/gain ²	12.3	12.5		
Cattle gain, lb/ton of crop ensiled ²	133.4	127.5		

¹ 100% dry matter basis.

² Values are adjusted to the same silage DM content; 35 percent.

^{a, b} Means not having common superscripts differ (P<.01).

^{c, d} Means not having common superscripts differ (P<.05).



ALFALFA VARIETY PERFORMANCE IN SOUTHEASTERN KANSAS

Joe L. Moyer

Summary

Excellent growing conditions in 1987 produced the highest alfalfa yields in recent years. In the second year of the test, the cultivar 'Endure' continued to perform well, whereas other varieties' relative production varied between the 2 years.

Introduction

The importance of alfalfa as a feed crop and/or cash crop has increased in recent years. The worth of a particular variety is determined by many factors, including its pest resistance, adaptability, longevity under specific conditions, and productivity. The second growing season of this test has just concluded.

Experimental Procedure

The 15-line test was seeded (12 lb/acre) in April, 1986 at the Mound Valley Unit. Plots were sprayed with Furadan (1.5 pt/acre) on April 20, 1987 to control a moderate but increasing weevil population. Five harvests were obtained in 1987, and plots were fertilized with 0-40-150 lb/acre of N-P₂O₅-K₂O on September 2.

Results

Forage yields for each of the five cuttings and total 1987 production are shown in Table 1. Yields were excellent in 1987, ranging from 6.52 to 7.27 tons/acre (12% moisture), because of generally abundant moisture and relatively mild temperatures in much of the season. Good to excellent, uniform stands were maintained in 1987.

Total forage production of the top three cultivars, KS196, WL-320, and 'Endure' was significantly greater than production of the three that yielded least in 1987, 'Kanza', 655, and K82-21. 'Endure' has performed well both years of the test; K82-21, 655, and Southern Special performed well the first but not the second year; and WL-320 produced well this year but was only average in the first year.

Table 1. Alfalfa Varieties' 1987 Forage Yield, Mound Valley Unit, SEK Station.

Source	Variety	Harvest Dates					TOTAL
		5/8	6/12	7/14	8/21	10/27	
- - - - - tons/acre @ 12% moisture - - - - -							
USDA-KSU	KS196 EXP	2.17a ¹	2.02a	1.75ab	1.34abc	1.16a	7.27a
Waterman-Loomis	WL-320	2.15ab	2.00a	1.74ab	1.23abcd	0.98bc	7.12ab
PAG Seeds	Endure	2.23a	1.92ab	1.70abc	1.22abcd	0.94bc	7.07ab
Garst	636	2.22a	1.92ab	1.67abcd	1.16bcd	0.90c	6.97abc
Garst	630	2.08ab	1.88ab	1.80a	1.20abcd	0.92bc	6.96abc
Waterman-Loomis	Southern Special	1.90bc	1.98ab	1.66abcd	1.35abc	0.94bc	6.90abc
Cargill	EXP 339	2.23a	1.92ab	1.62abcd	1.12d	0.94bc	6.88abc
USDA-KSU	Riley	2.20a	1.88ab	1.52cd	1.21abcd	0.90c	6.80abc
Agripro	Arrow	2.19a	1.81ab	1.60abcd	1.18bcd	0.96bc	6.78bc
Agripro	Dart	2.15ab	1.80ab	1.54bcd	1.22abcd	0.94bc	6.71bc
Asgrow/O's Gold	Eagle	2.01abc	1.82ab	1.61abcd	1.26abcd	0.96bc	6.70bc
Great Plains Res.	Cimarron	2.03abc	1.74ab	1.49cd	1.40a	0.92bc	6.66bc
USDA-KSU	K82-21 EXP	1.81c	1.80ab	1.62abcd	1.37ab	1.05ab	6.58c
Garst	655	2.10ab	1.70b	1.48d	1.26abcd	0.93bc	6.54c
USDA-KSU	Kanza	2.08ab	1.76ab	1.53cd	1.14cd	0.88c	6.52c

¹ Means within a column followed by the same letter do not differ (P=.05) according to Duncan's test.

ACCELERATED AGING OF ENDOPHYTIC TALL FESCUE SEED

Joe L. Moyer

Summary

Incubating endophytic fescue seed for up to 24 days at 104° F in the absence of humidity had no major effect on seed germination or endophyte frequency. Relative humidities of 50% and 100% produced rapid declines in both characteristics at that temperature, but live endophyte level was affected more quickly than seed germination.

Introduction

Tall fescue is the most important cultivated grass in southeastern Kansas and in much of the mid-temperate region of the U.S. It is an agronomically superior grass under a wide range of soil conditions and tolerates abusive grazing. However, animal performance on tall fescue forage is often inferior to that on other grasses, despite similarity in laboratory tests for forage quality. Many of the poor performance traits from using tall fescue seem to be associated with the presence of the endophytic fungus, Acremonium coenophialum.

The endophytic fungus appears to be transmitted solely as a seed-borne organism, but its elimination requires destruction of the host plant. Thus, fungus-free tall fescue pastures can be obtained only by planting fungus-free fescue seed. Since the elimination of fescue toxicoses would be of substantial benefit to livestock producers using tall fescue forage, the demand for low-endophyte seed will likely continue to increase. Most local seed fields have relatively high endophyte frequencies, but a method of eliminating live endophyte from seedlots could increase the supply of locally produced seed.

Reports from the southeastern U.S. indicated that seed aged for 1 year was usually very low in endophyte frequency. However, seedlots in other parts of the country varied considerably in endophyte level after a year of storage. An experiment at Manhattan indicated that the endophyte could survive in seed for weeks at a temperature in excess of 100° F. However, a slow but steady decline in endophyte viability in seed was observed in a 40° F coldroom with uncontrolled humidity. The importance of humidity was indicated in a preliminary experiment comparing seed incubated at 104° F for periods of up to 8 days in a germinator versus a convection oven. Plants from the germinator-aged seed had no live endophyte, but those from oven-incubated seed showed little change from pretreatment endophyte levels. Further experiments were designed to test the effects of accelerated (high-temperature) aging at high humidity on endophyte survival and seedling viability.

Experimental Procedure

Fescue seed with a high endophyte frequency was obtained in summer, 1986, and stored in a freezer. Seedlots were treated at 104° F in one of three environments: a convection oven (0% R.H.), a seed germinator (100% R.H.), and a controlled environment growth cabinet with humidity control set at 50% R.H. Samples were treated in open paper coin envelopes and removed at the specified time. Following treatment, the seed was kept dessicated at 40° F until seed germination and grow-out tests for endophyte frequency could be performed.

Fifty seeds were germinated on moist blotter paper at 68° F in the germinator, with each run repeated (replicated) three times. Seedlots were grown in flats of clay chips under artificial (16-hr/day) lights in a growth bench, periodically watered with complete nutrient solution. Temperature reached almost 90° F during the day, 75° F at night. Six to 12 plants per row (replication) were selected for cytological examination of the leaf sheath after staining with a solution containing aniline blue, and frequencies were based on the number of plants testing positive for endophyte per number examined.

Results

The effects of seed incubation at three humidities for various lengths of time on seed germination and live endophyte frequency are shown in Figure 1. Values are means of four seedlots, with and without Captan. The latter treatment had no effect on either parameter, and while seedlots varied significantly, they were similarly affected by treatment (no significant 2-way interactions). Incubation in the dry environment produced no change in germination over the period, but did result in a slight reduction in endophyte frequency after 24 days. Results were similar, though more erratic, in the 50% relative humidity environment, except that the endophyte frequency was very low after 24 days. In the saturated environment, both germination and endophyte frequency were significantly reduced after 4 days. An additional 4 days' incubation at high humidity had little further effect, but by 16 days' incubation, all seedlings were killed.

A follow-up replicated experiment was performed using only seed from the Lewis Good farm northwest of Parsons. Seed was incubated as before, but only for an 8-day period, and comparisons included a control kept dessicated in the coldroom. Results of a cytological examination of 12 seedlings each for three replications are shown in Table 1. Results verified those of the previous experiment, with the high humidity treatment eliminating live fungus from that seedlot in 8 days. Lower humidities had minor effects on fungus frequencies.

Figure 1. Tall Fescue Seed Germination (A) and Endophyte Frequency (B) As Affected by Time of Incubation at Different Humidities.

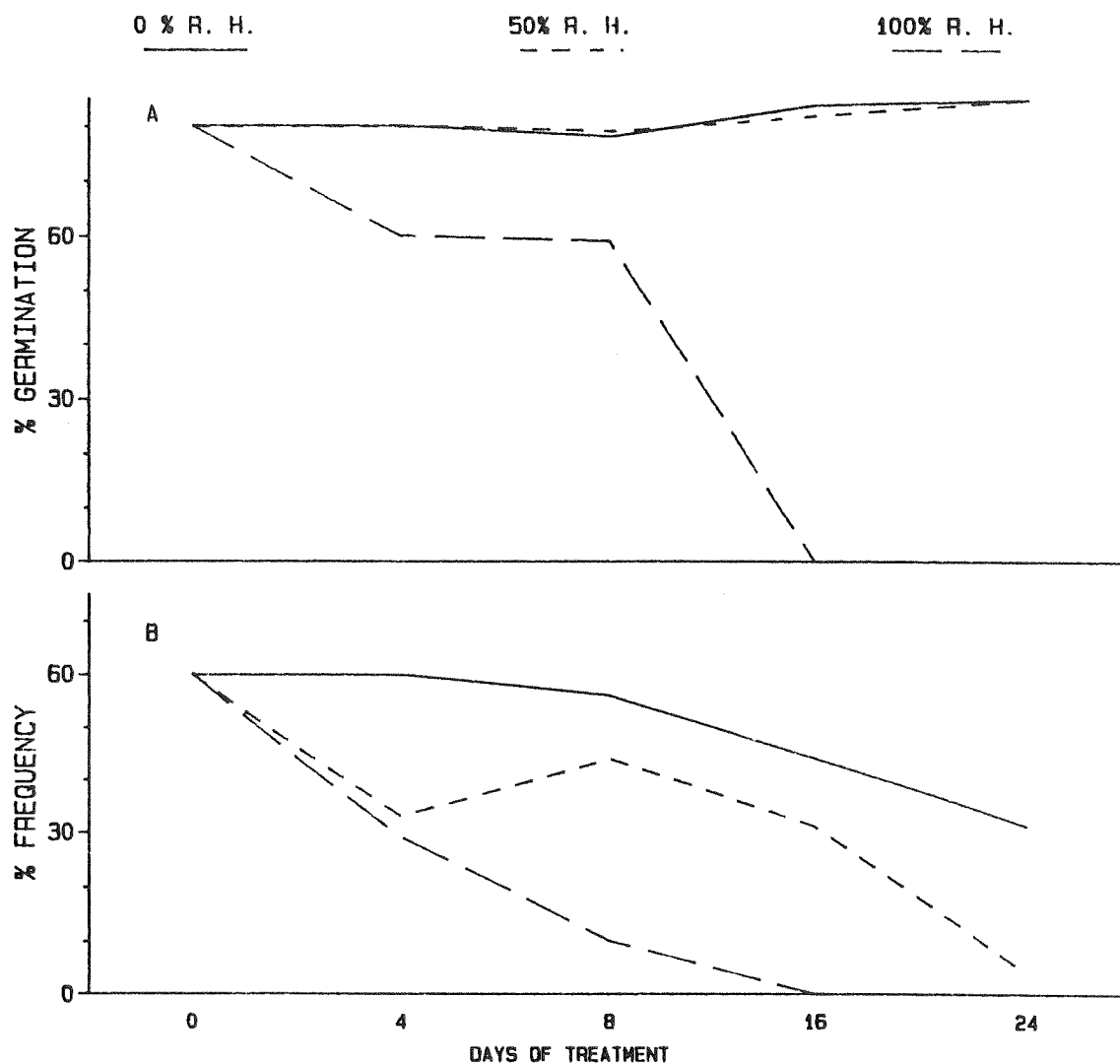


Table 1. Effect of 8-Day Treatment at 104° F and Three Relative Humidities on Endophyte Frequency of Seedlings from Lewis Good Seed.

Relative Humidity	Endophyte Frequency
0	67
50	53
100	0
Control	61
LSD(0.05)	32



LESPEDAZA INTERSEEDING, LIME, AND P-K FERTILIZATION OF NATIVE GRASS MEADOW

Joe L. Moyer

Summary

Warm-season grass and total forage production were increased in 1987 by fertilization with 0-40-40 in 1980. Interseeding lespedeza did not increase grass production or forage crude protein content. Liming in 1980 did not affect any parameter measured in 1987.

Introduction

Hay production from native meadow has been increased by small amounts of nitrogen (N). Returns from fertilization do not always cover the cost, and fertilization can encourage undesirable species. Since native hay is usually low in nutrients such as protein and minerals, legumes in the stand could add N for grass growth and improve overall forage quality. This study was to determine whether lime and/or P-K fertilization would promote legume establishment, production, and native forage yield and quality.

Experimental Procedure

Lime was applied to designated plots on March 19, 1980 at 2400 lb ECC/acre. Fertilizer sufficient to provide 40 lb/acre each of P_2O_5 and K_2O was applied in April, 1980. Legumes were broadcast-seeded in 1981, but dry spring weather prevented stand establishment. In 1987, the plot area was burned on April 9, and seeding was performed with a no-till plot seeder using a rate of 20 lb/acre. Common Korean lespedeza seed was obtained locally and Ark S-100 seed was obtained from Dr. Beuselinck at the University of Missouri. Subplots (12' x 14") were cut with a sickle on July 13, 1987, and the forage was dried and saved for hand separation into its major components. Warm-season grass and lespedeza components were ground and assayed for crude protein content.

Results

Fertilization with P and K in 1980 increased warm-season grass and total forage production in 1987, but had no significant effect on lespedeza production or forage crude protein content (Table 1). Interseeding treatment did not increase grass or total forage production or crude protein content. Dry matter production of lespedeza was low, despite fair to good stands in seeded plots. Liming had no effect on any forage characteristic measured and did not significantly interact with any of the other treatment factors.

The low amount of lespedeza produced was not sufficient to affect forage quality and also indicates that little N was fixed. In any case, there should be little legume N cycled for grass growth in the first season of legume growth. Legumes will be seeded for at least another year to check for N-fixation effects.

Table 1. Dry Matter Production and Crude Protein Content of Native Meadow Forage as Affected by Lespedeza Interseeding, Lime, and P-K Fertilization.

Treatment	Forage Production			Crude Protein
	W.S. Grass	Lespedeza	Total	
	- - - - - 1b D.M./acre - - - - -			%
<u>Legume Interseeding</u>				
None	2654	3	2808	4.7
Korean	2767	106	3098	4.8
Ark S-100	2604	124	2906	4.9
LSD(0.05)	NS	39	NS	NS
<u>Lime</u>				
None	2668	89	2906	4.8
2400# E.C.C.	2682	67	2970	4.8
LSD(0.05)	NS	NS	NS	NS
<u>P-K Fertilization</u>				
None	2515	68	2767	4.8
0-40-40	2835	87	3108	4.8
LSD(0.05)	217	NS	260	NS



FORAGE YIELDS OF TALL FESCUE VARIETIES IN SOUTHEASTERN KANSAS

Joe L. Moyer

Summary

The first harvest year of the test, 'Stef' and 'Mozark' produced significantly less forage than 'Kenhy' in the first two cuttings. 'Forager' fescue was relatively poor in forage quality, whereas 'Phyter' had high forage quality. Maturity of first-cut forage varied among varieties, but the dry matter content of Forager forage was not significantly higher than that of Phyter.

Introduction

Tall fescue is the most widely grown forage grass in southeastern Kansas. New and old cultivars were compared for agronomic adaptation and forage quality, since the variety chosen for a new seeding will have effects for as long as the stand exists.

Experimental Procedure

Plots were seeded on September 4, 1986 at 20 lb/acre at the Mound Valley Unit, ostensibly with endophyte-free seed. Plots were 30 x 7.5 ft each, in four randomized complete blocks. Fertilizer application totalling 80-40-40 lb/acre of N-P₂O₅-K₂O was made on March 10, 1987, with 40-40-40 applied on September 2, 1987. Plots were cut on May 8, June 25, and October 27 in 1987 because of better-than-normal growing conditions. A subsample from each plot was collected for moisture, crude protein, and neutral-detergent fiber (NDF) determinations.

Results

In the first cutting, Forager and 'Johnstone' yielded significantly more than 'Triumph', whereas Stef produced less forage than all other varieties (Table 1). Forage dry weight percentages for the first cutting are shown to indicate the maturity differences seen in the varieties. By that criterion, Triumph and Forager were among the earliest maturing, whereas Johnstone was latest, with Kenhy and Stef appearing relatively late-maturing. By the second cutting, Triumph was in the higher-yielding group, while 'Festorina' yielded significantly less than Kenhy. Third-cut yields were not reported because of the possibility of collecting remnants of previous growth, but yield was greater from 'Mo-96' and ISI-TTFL than from Johnstone and Stef (data not shown).

Forage quality information in the form of crude protein contents and percent NDF for the first two cuts are also in Table 1. First-cut forage crude protein was higher in Phyter and Mo-96 than in Forager and Festorina. Martin second-cut forage had more crude protein than Forager, Kenhy, 'Ky-31', and Mozark, whereas Phyter ranked second.

Lowest first-cut forage NDF values were found in Phyter and 'Fawn', which were significantly lower than Forager. From the second cutting, forage NDF was lower in Mo-96 and Phyter than in Festorina, Forager, Kenhy, Ky-31, or Fawn. Martin was also lower in second-cut forage NDF than Festorina or Forager.

Forage quality parameters in the first cutting were more closely related to one another than to percent dry weight of forage. The two highest protein lines had low NDF values but were intermediate in forage dry matter percentage. The two lines lowest in forage protein were highest in NDF, but only one, Forager, was also high in dry matter percentage. Thus, it appears that other varietal factors in addition to maturity were influencing forage quality in the first cutting.

Third-cut forage quality estimates were similar in ranking to those of earlier harvests, with one notable exception (data not shown). Crude protein percentage ranged from 12.7 to 9.4%, with Mozark, Phyter, and Mo-96 having higher concentrations than Festorina. Forage NDF percentages ranged from 63.9 to 69.0%, with Mozark, Fawn, and Phyter having less fiber than Triumph. Mozark showed an apparent relative improvement in quality of fall forage.

Table 1. First-year (1987) Forage Yield (@12% moisture) and Quality from Two Cuttings of Tall Fescue Varieties, Mound Valley Unit, Southeast Kansas Branch Experiment Station.

Variety	Cut 1 (May 5)				Cut 2 (June 25)			Cut 1 + Cut 2
	Yield	Dry Wt.	Crude Protein	NDF	Yield	Crude Protein	NDF	
	tons/acre	- - - - % - - - -	- - - - % - - - -	- - - - % - - - -	tons/acre	- - - % - - -	- - - % - - -	tons/acre
Kenhy	3.05	24.0	13.5	61.8	2.56	10.4	68.8	5.61
Mo-96	3.03	25.0	15.4	60.1	2.30	12.6	64.1	5.34
Forager	3.12	26.5	11.6	65.8	2.22	10.2	69.0	5.35
ISI-TTFL	2.79	24.6	14.6	63.6	2.40	11.1	67.0	5.19
Phyter	2.80	25.2	15.9	58.4	2.23	13.2	64.1	5.04
Martin	2.66	25.4	15.1	63.0	2.40	14.4	65.5	5.07
Festorina	3.02	24.8	12.3	64.0	1.96	11.0	69.6	4.98
Triumph	2.61	26.7	15.0	61.5	2.48	11.8	66.5	5.09
Fawn	2.76	26.2	13.5	58.6	2.32	11.4	67.7	5.08
Ky-31	2.77	25.4	14.0	62.0	2.10	10.5	67.7	4.88
Johnstone	3.12	22.2	14.0	62.0	2.13	12.6	65.6	5.25
Mozark	2.65	26.4	12.7	60.5	2.10	10.6	66.6	4.75
Stef	1.93	24.6	14.6	62.2	2.39	11.2	66.5	4.32
LSD(.05)	0.49	2.0	2.4	4.8	0.55	2.9	2.9	0.75



TESTS OF WARM-SEASON, PERENNIAL FORAGE GRASSES

Joe L. Moyer

Summary

Two separate tests of warm-season, perennial grasses were harvested for forage production, and forage analyses were performed. Total production was similar among the entries, averaging about 1.2 and 1.5 tons/acre in the warm-season cultivar and big bluestem tests, respectively. Forage quality was also similar among cultivars.

Introduction

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

Experimental Procedure

Warm-season grass plots were broadcast-seeded on 19 June, 1984 at the Mound Valley Unit, Southeast Kansas Experiment Station. Old World bluestems ('W.W. Spar' and 'W.W. Ironmaster') were obtained from Dr. Chet Dewald, USDA Southern Plains Station, and seeded at 5 lb material/acre. Bluestem and indiagrass were seeded at 10 lb material/acre. Plots were clipped to control weeds in 1984 and early 1985. Harvests began in fall, 1985, two cuts were taken in 1986, and the 1987 harvest was taken on June 29.

Big bluestem was seeded with a cone planter in 12-inch rows on 20 June, 1985 at 12 lb PLS/acre in plots adjacent to those previously described. Stand counts, plant heights, and other seedling measurements were taken after the first growth season, the center rows were cut twice in 1986 and June 29 in 1987 for forage production, and culms from the outside rows were counted and threshed for estimation of seed production.

Results

Forage yields, crude protein content, and neutral-detergent fiber (NDF) from the warm-season cultivar test are shown in Table 1. Plots with incomplete stands were not harvested, so significant differences were difficult to obtain. Only W.W. Spar had solid stands in all four replications, and that cultivar yielded as much as 'Osage' indiangrass. The big bluestem cultivar, 'Kaw', had the highest crude protein content and lowest NDF, but forage quality seemed low for June 29 forage in all the entries.

The big bluestem test (Table 2) was harvested on the same day as the warm-season cultivar test. No differences in forage or seed yield or in quality parameters were found among the cultivars in 1987. Yields averaged 1.5 tons/acre (12% moisture) for forage and 233 lb/acre for seed production. Production appeared higher in Kaw and T04237 than in 'Rountree' and 'Pawnee'. Rountree had relatively good forage quality, with 6.6% crude protein and 51% NDF.

Table 1. Forage Yield, Crude Protein, and NDF of Warm-season Grass Cultivars Harvested June 29, 1987.

Cultivar	Forage Yield	Crude Protein	NDF
	tong/acre ¹	- - - - % - - - -	
W.W. Spar	1.25	4.9	76.4
W.W. Ironmaster	1.16	4.5	73.9
Kaw ²	1.19	5.1	72.1
Osage ²	1.28	4.9	72.6
LSD(0.05)	NS	NS	NS
Average	1.21	4.9	73.8

¹Yields reported at 12% moisture content.

²Big bluestem and indiangrass, respectively.

Table 2. Big Bluestem Variety 1987 Forage and Seed Production, and Crude Protein and IVDMD of Second-cut 1986 Forage.

Entry	1987 Production		1986 Analyses	
	Forage	Seed	C.P.	IVDMD
	tons/a	lb/acre	- - - % - - -	
Rountree	1.32	211	6.6	51
Kaw	1.61	122	6.0	52
T04237	1.63	236	6.5	54
Pawnee	1.40	260	6.2	54
LSD(0.05)	NS	NS	NS	NS
Average	1.49	233	6.3	53





EFFECT OF FLUID FERTILIZER PLACEMENT AND TIMING ON TALL FESCUE AND BROMEGRASS YIELD

J.L. Moyer and D.W. Sweeney

Summary

Both fescue and bromegrass responded to N fertilization up to 150 lb/a. Knifing of the fluid N fertilizer resulted in higher fescue and bromegrass yields than surface applications. Time of application (fall or spring combinations) did not affect either fescue or bromegrass yields in the first year of this study.

Introduction

Several million acres of seeded cool-season grasses exist in eastern Kansas, mostly tall fescue and smooth bromegrass pastures. Much of the cool-season grass in southeastern Kansas has been in long-term production and continually fertilized by top-dressing. This study was initiated in 1986 to determine how yield of tall fescue and smooth bromegrass is affected by 1) timing of N application, 2) method of fluid N application as either broadcast, dribble, or knife at 4", and 3) N rates of 75 and 150 lb/a.

Experimental Procedure

N fertilization timing schemes were 1) 100% of the N applied in the fall, 2) 100% of the N applied in the spring, or split N applications consisting of 3) 67% of the N in fall and 33% of the N in spring, and 4) 33% of the N fall applied and 67% of the N in spring. Fall UAN (urea-ammonium nitrate solution - 28% N) fertilization dates were Oct. 30 and 31, 1986, whereas spring N applications were made on March 9 and 10, 1987 for the fescue and bromegrass, respectively. Dribble and knife spacing were 10 inches. Uniform broadcast applications of 39 lb P_2O_5 /a and 77 lb K_2O /a were made to all plots on Oct. 29, 1987. A 3 ft x 20 ft area was harvested on May 13 and 21, 1987 for fescue and bromegrass, respectively.

Results

Tall fescue or bromegrass yields were not affected by timing of N application (Table 1). Timing also did not interact with either method or N rate, which suggests that fertilizer placement may not influence the availability of fall- as compared to spring-applied N for either fescue or brome-grass. However, regardless of N application timing, knife applications resulted in approximately 0.3 ton/a higher yields than broadcast for fescue and brome-grass. Knife applications also resulted in higher yield than dribble application for fescue, whereas dribble and knife applications for brome-grass

were not significantly different. Increasing the N rate from 75 to 150 lb/a increased both fescue and bromegrass yields by approximately 0.5 ton/a. However, a 0.7 to 0.8 ton/a increase was obtained when 75 lb N/a was applied as compared to the check.

Table 1. Effect of Fluid N Rate, Placement and Time of Application on Tall Fescue and Smooth Bromegrass Yields.

Treatment	Yield @ 12% moisture	
	Fescue	Bromegrass
	-----ton/a-----	
<u>Timing</u>		
100% of N in fall	2.36	2.42
67% of N in fall - 33% of N in spring	2.54	2.62
33% of N in fall - 67% of N in spring	2.46	2.59
100% of N in spring	2.43	2.71
LSD (0.05)	NS	NS
<u>Method</u>		
Broadcast	2.29	2.41
Dribble	2.43	2.65
Knife	2.62	2.69
LSD (0.05)	0.15	0.23
<u>N Rate (lb/a)</u>		
75	2.18	2.34
150	2.72	2.83
F Value	**	**
<u>Interaction(s)</u>		
	NS	NS
<u>Check¹</u>	1.32	1.61

¹Not included in the 4x3x2 factorial analyses.



EFFECT OF LEGUMES ON SUBSEQUENT GRAIN SORGHUM YIELD
AND N UPTAKE IN CONSERVATION TILLAGE SYSTEMS

D. W. Sweeney and J. L. Moyer

Summary

Grain sorghum yields were higher following either red clover or hairy vetch than following grain sorghum. Grain sorghum yields were also higher in reduced tillage areas than no-tillage. The lack of response to applied fertilizer N in any of the systems was likely related to the high organic matter and organic N levels of the soil at the two sites used in this study.

Introduction

This study was initiated to evaluate the use of a spring-seeded (red clover) and a fall-seeded (hairy vetch) legume in reduced and no-tillage systems on subsequent grain sorghum production. Nitrogen rates from 0 to 120 lb/a were applied in each system to estimate the N contribution from the legumes.

Experimental Procedure

The experiment was a split-split plot arrangement of a randomized complete block design with three replications. The whole plots were previous crop: red clover, hairy vetch, or grain sorghum. The first split was tillage system: reduced tillage or no-tillage. The second split was N rates of 0, 30, 60, 90, and 120 lb/a. The experiment was conducted on two adjacent sites at the Parsons Field of the Southeast Kansas Branch Experiment Station. One site (Site 1) had 24 lb available P per acre and 160 lb available K per acre, whereas the other site (Site 2) had 8 lb available P per acre and 120 lb available K per acre in the surface soil zone. Site 1 was plowed from native grass in spring 1979, whereas Site 2 was plowed from native grass in fall 1983. To establish the previous crop for subsequent grain sorghum production, red clover was planted on March 21, 1986, grain sorghum was planted on June 17, 1986, and hairy vetch was planted on September 10, 1986. No-till plots in the red clover and hairy vetch areas were sprayed with 1 qt/a of glyphosate on May 11 and 3 pt/a of 2,4-D ester on May 18, 1987. No-till plots in the previous grain sorghum area were sprayed with 1 qt/a of glyphosate on May 21, 1987. Reduced tillage plots in all previous crop areas were offset disced with one pass on May 11, 1987. Nitrogen as UAN solution (28% N) was dribble applied on June 10, 1987 at the rates listed above. Pioneer 8585c grain sorghum seed was planted in all areas at 62,000 seed/a on May 15, 1987.

Results

At Site 1, yields of grain sorghum following either red clover or hairy vetch were higher than those of grain sorghum following grain sorghum (Table 1). At Site 2, the lower soil P and K fertility site, grain sorghum yields following hairy vetch were 11 bu/a higher than those following red clover; however, this difference was not significant. Both previous legume crop systems resulted in higher yield than continuous grain sorghum. At both sites, reduced tillage resulted in more than 15 bu/a higher yields than with no-tillage. Nitrogen rate did not significantly affect grain sorghum yields at either site. Moisture stress induced by only 1.14" of rainfall from July 19 through August 12, with average day temperatures near 100°F and in conjunction with sorghum webworm, likely reduced the grain sorghum yield potential in all systems.

Nitrogen concentration in the above-ground portion of the grain sorghum plants at the soft dough growth stage tended to be higher following a legume or with reduced tillage, even though these main effects were not significant at Site 1 (Table 1). However, at both sites, increasing N rate increased N concentration in the plant. Nitrogen uptake by grain sorghum was greater following either legume or with reduced tillage at both sites. In contrast to the N concentration data, N uptake was not significantly affected by N rate. The small responses to N rate are likely related to the soil organic matter and organic N content. Background soil organic matter content was approximately 3% at both sites, and soil organic N levels were approximately 1400-1500 ppm (2800-3000 lb N/a). Therefore, the response of grain sorghum to previous legume systems or tillage may be related to additional factors as well as to N.

Table 1. Effect of Previous Crop, Tillage, and N Rate on Grain Sorghum Yield and N Concentration and N Uptake at the Soft Dough Stage at Two Sites at the Parsons Field in 1987.

Treatment	Yield		Soft Dough Growth State			
	Site 1	Site 2	N Concentration		N Uptake	
	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
	--- bu/a ---		----- % -----		---- lb/a ----	
<u>Previous Crop</u>						
Red clover	56.7	39.1	1.69	1.42	121.0	114.2
Hairy vetch	55.5	50.4	1.61	1.28	128.3	111.8
Grain Sorghum	27.9	21.9	1.39	1.15	96.4	81.0
LSD (0.05)	10.4	12.7	NS	0.09	24.8	24.3
<u>Tillage</u>						
Reduced	59.3	45.5	1.60	1.34	125.0	113.5
No-tillage	34.1	28.8	1.53	1.23	105.5	91.2
LSD (0.05)	12.7	11.3	NS	0.06	15.7	10.1
<u>N rate (lb/a)</u>						
0	45.0	35.0	1.44	1.19	111.1	92.2
30	43.9	34.8	1.54	1.27	112.6	102.9
60	47.3	39.3	1.54	1.30	116.4	101.6
90	48.2	37.9	1.61	1.33	106.2	105.0
120	49.1	38.7	1.70	1.34	130.0	110.0
LSD (0.05)	NS	NS	0.12	0.11	NS	NS
<u>Interaction(s)</u>	NS	NS	PxT	NS	NS	NS



EFFECT OF P and K RATES AND FLUID FERTILIZER
APPLICATION METHOD ON DRYLAND ALFALFA YIELD¹

D.W. Sweeney, J.L. Moyer, and J.L. Havlin²

Summary

First year results were obtained on an established alfalfa stand that had very low P and low K soil levels. Yields at the first cutting were increased by the application of at least 80 lb P₂O₅/a. However, at the second and third cuttings, yields were only increased by the addition of 160 lb K₂O/a. Knifing the fluid fertilizers resulted in highest first and third cutting alfalfa yields as compared to surface applications, but placement did not affect the second cutting yields.

Introduction

Alfalfa production in Kansas totals approximately 1 million acres. Efficient fertilizer use can result in large economic returns for alfalfa producers. Limited work has been done in Kansas concerning fertilizer options for alfalfa. Therefore, a study was initiated to determine how alfalfa yields are affected by P and K rates and method of fluid fertilizer application.

Experimental Procedure

An off-station site was established in spring 1987, using an alfalfa stand that was planted in fall 1984. Background soil P and K levels in the surface 6" were 10 and 120 lb/a, respectively. The treatments were randomized in a complete block with four replications. Two separate analyses (experiments) were made. The first analysis compared liquid fertilizer P rates of 0, 40, 80, and 120 lb P₂O₅/a and K rates of 0, 80, and 160 lb K₂O/a when dribble applied. The second analysis compared broadcast, dribble, and knife at 4-inch application methods at P rates of 40 and 80 lb P₂O₅/a and K rates of 0 and 80 lb K₂O/a. Fertilizer applications were made on April 2, 1987. Three cuttings from a 3 x 20' area from each plot were taken on May 19, June 22, and August 5. The site was abandoned after August 5 for logistic reasons.

¹Research is partially supported by grant funding from the Fluid Fertilizer Foundation.

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Results

Experiment 1

At the first cutting, P rate significantly affected yields; however, K rate had no effect (Table 1). P rates of 80 and 120 lb P_2O_5 resulted in higher first cutting yield than no P. However, the differences in mean yields were small, regardless of P or K level. At the second and third cuttings, P had no effect on yield; however, K applied at a rate of 160 lb K_2O/a increased alfalfa yield. Total yield from the three cuttings was not affected by P rate, but was approximately 0.5 ton/a higher with 160 rather than 0 or 80 lb K_2O/a application rate.

Experiment 2

The only factor that significantly affected individual cutting or total yields was fluid fertilizer placement (Table 2). At the first cutting and for the total, knifing resulted in higher yields than either broadcast or dribble. Yields at the second cutting were not affected by placement. However, at the third cutting, knife resulted in significantly higher yields than dribble applications. At the P and K rates used in this analysis, total alfalfa yield was increased 0.5 ton/a by knifed applications. The reason that P_2O_5 rates of 40 and 80 lb/a and K_2O rates of 0 and 80 lb/a did not affect yields regardless of application method may be explained from the data obtained in Experiment 1. It is likely that P and K rates similar to those in Experiment 1 were needed to obtain a yield response at this site under the environmental conditions experienced.

Table 1. Alfalfa Yields from Individual Cuttings and Total Yield in 1987 as Affected by P and K Rates of Dribble-Applied Fluid Fertilizer.

Treatment Means	Yield @12% Moisture Cuttings			Total
	1	2	3	
	-----ton/a-----			
<u>P₂O₅ (lb/a)</u>				
0	1.00	1.22	0.79	3.01
40	1.06	1.26	0.81	3.13
80	1.15	1.26	0.79	3.20
120	1.15	1.30	0.90	3.35
LSD (0.05)	0.12	NS	NS	NS
<u>K₂O (lb/a)</u>				
0	1.06	1.17	0.74	2.97
80	1.11	1.12	0.81	3.04
160	1.10	1.49	0.92	3.51
LSD (0.05)	NS	0.23	0.10	0.29
<u>Interaction</u>				
F Value	NS	NS	NS	NS

Table 2. Alfalfa Yields from Individual Cuttings and Total Yield in 1987 as Affected by Placement and P and K Rates of Fluid Fertilizers.

Treatment Means	Yield @ 12% Moisture Cuttings			Total
	1	2	3	
	-----ton/a-----			
<u>Placement</u>				
Broadcast	1.04	1.13	0.81	2.98
Dribble	1.08	1.14	0.74	2.96
Knife	1.30	1.22	0.93	3.45
LSD (0.05)	0.16	NS	0.12	0.28
<u>P₂O₅ (lb/a)</u>				
40	1.14	1.11	0.83	3.08
80	1.14	1.21	0.82	3.17
F Value	NS	NS	NS	NS
<u>K₂O (lb/a)</u>				
0	1.16	1.17	0.79	3.12
80	1.13	1.15	0.86	3.14
F Value	NS	NS	NS	NS
<u>Interaction(s)</u>	NS	NS	NS	NS



EFFECT OF PREVIOUS RESIDUE MANAGEMENT AND N RATE ON YIELDS IN A CONTINUOUS SMALL GRAIN - DOUBLECROP SOYBEAN ROTATION

D. W. Sweeney

Summary

Since 1983, response of doublecropped soybeans to wheat straw management has been sporadic. In 1985 and 1987, soybean yield was higher in disc-only areas than in the other residue management systems. However, generally, the previous residue management for doublecrop soybeans has affected the subsequent small grain yields. When soybeans were grown no-till, wheat or oat yields were as much as 21 bu/a lower than when the previous residue was either disced or burned then disced.

Introduction

Doublecropping soybeans after wheat or other small grains such as oats is practiced by many producers in southeastern Kansas. Several options exist for dealing with straw residue from the previous small grain crop. The method of managing the residue may affect not only the doublecrop soybeans but also the following small grain crop. Since wheat (or oat) residue that is not removed by burning or is not incorporated before planting soybeans may result in immobilization of N applied for the following small grain crop (usually wheat), an additional objective of this study was to observe whether an increase in N rate, especially where doublecrop soybeans were grown with no-tillage, could increase small grain yields.

Experimental Procedure

Three wheat residue management systems for doublecrop soybeans with three replications were established in spring 1983: no-tillage, disc only, and burn then disc. After the 1983 soybean harvest, the entire area was disced, field cultivated, and planted to wheat. Before field cultivation, 300 lb/a of 6-24-24 was broadcast in all areas. In spring 1984, 67 lb N/a as urea was broadcast as a topdressing to all plots. Wheat yield was determined in areas where the three residue management systems were imposed previously. In spring 1985, residue management plots were split, so that two topdress N rates were applied. Topdress N rates of 57 and 103 lb N/a gave total yearly N applications for wheat of 83 and 129 lb N/a, respectively. These residue management and N rate treatments were continued through 1986 and 1987. However, because of poor stands of late-planted wheat in 1986 and the inability to plant wheat in fall 1986, spring oats were planted in 1986 and 1987.

Results

Wheat residue management had no significant effect on the yield of soybeans in 1983 (data not shown). Drought conditions resulted in an overall mean yield of 5.4 bu/a. Soybeans planted doublecrop in 1984 were also severely affected by drought conditions. Soybean plants were too small to be harvested; therefore, no harvest data were obtained. Even though rainfall conditions were more favorable in 1985, no rain for approximately 3 weeks after planting resulted in poor weed control in no-till plots and, thus, no yield. In 1985, soybeans planted after discing the wheat residue yielded 21.1 bu/a, whereas soybeans planted after burning and then discing yielded 14.4 bu/a. The topdress N rate for the previous wheat crop did not affect the doublecrop soybean yields. Soybeans in 1986 were not affected by residue management or residual N rate, resulting in a mean yield of 10.4 bu/a (data not shown). In 1987, an interaction between the residue management and residual N rate occurred. In the burn-then-disc and the disc only systems, a high N rate applied to the wheat resulted in 3 to 4 bu/a higher soybean yields than the low N rate, whereas soybean yields tended to be 1 bu/a less when the high N rate was applied to wheat in no-till management systems (data not shown). The highest soybean yields of 18.2 bu/a in 1987 were with the disc-only system in the area that received the high N rate for wheat.

Management of wheat residue in 1983 significantly influenced the 1984 wheat yields (Table 1). When soybeans had been planted no-till in 1983, the 1984 wheat crop yielded 16 and 20 bu/a less than when the residue had been discing or burned then discing, respectively. (No significant occurrence of disease, including tan spot, was evident in the plots.) The percent protein in the grain was also lower ($p < 0.10$) where no tillage had been used for the doublecrop soybeans than with the other systems. This suggested a possible N immobilization when the previous years' wheat straw was tilled into the soil after no-till, doublecrop soybeans and immediately prior to wheat planting.

Because of the above results, two N rates were applied to the wheat grown in 1984-85 as well as in the following years. Since work during the past several years by Ken Kelley at the Southeast Branch Station has shown no yield advantage to N rates exceeding 90 to 100 lb/a, total N rates were established at 83 and 129 lb/a. This was done so that if immobilization were a factor in limiting wheat yields in areas that previously grew no-tillage, doublecrop soybeans, yield responses to N rate would be likely in those plots but not in the burn-disc or disc-only plots. Wheat harvested in 1985 yielded 7 and 11 bu/a less when the previous doublecrop soybeans had been planted no-till rather than disc-only or burn-then-disc, respectively (Table 1). (All plots showed moderate disease pressure; however, no differences were noted between tillage systems.) Yield was not affected by N rate nor was there an interaction between residue management systems and N rate. In addition, there was no statistical difference in protein level as affected by any treatment factor.

Oat yields in 1986 were also affected by the previous years' residue management system for planting doublecrop soybeans (Table 1). Oat yields were 15 and 21 bu/a less when doublecrop soybeans had been planted no-till as compared to a burn-then-disc or disc-only system, respectively. Similar to the 1985 wheat crop, 1986 oat yields were not significantly affected by N rate or

the interaction between residue management and N rate. Oat yields in 1987 were affected by an interaction between residue management system and N rate. Increasing N rate lowered oat yields in areas where doublecrop soybeans had been planted no-till, whereas increasing N rate increased oat yields where the residue management had been either burn-then-disc or disc- only. Protein values in oats in 1986 were affected by residue management and N rate but not by the interaction of these factors. However, in 1987, increasing N rate increased grain protein only at the 0.10 level, whereas residue management had no effect on percent protein. Since the above data show that increasing N rate from 83 to 129 lb/a does not increase yields of small grain crops, especially where soybeans had been planted no-till, if immobilization is a problem in "residual" no-till areas, other factors may limit the effectiveness of additional N.

Table 1. Yield and Protein Content of Wheat in 1984 and 1985 and Oats in 1986 and 1987 as Influenced by Previous Residue Management and N Application Rates.

Treatment	Yield at 12% Moisture				Protein in Grain			
	1984	1985	1986	1987	1984	1985	1986	1987
	-----bu/a-----				-----%-----			
<u>Previous residue mgmt.</u>								
Burn, then disc	63	59	79	51	15	15	13	14
Disc only	59	55	85	49	15	15	13	13
No-tillage	43	48	64	42	13	14	11	13
LSD 0.05	13	8	6	NS	NS	NS	1	NS
LSD 0.10	-	-	-	NS	1	NS	-	NS
<u>N Rate (lb/a)</u>								
83	-	53	77	47	-	14	12	13
129	-	55	75	47	-	15	13	14
F Value		NS	NS	NS		NS	**	10%
<u>Interaction</u>								
F Value		NS	NS	*		NS	NS	NS



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

D. W. Sweeney

Summary

Even though tillage did not affect grain sorghum yields in 1983, no tillage resulted in lower grain sorghum yield in 1985 and 1987 than either conventional or reduced tillage. Tillage did not affect soybean yield in either 1984 or 1986. N fertilization schemes did not affect grain sorghum yields in 1983 and have resulted in little or no effect on soybeans. However, N fertilization did increase grain sorghum yields in 1985 and 1987, with anhydrous ammonia application resulting in the highest yields.

Introduction

Many kinds of rotational systems are employed in southeastern Kansas. This experiment was designed to determine the effect of selected tillage and nitrogen fertilization options on the yields of grain sorghum and soybeans in rotation.

Experimental Procedure

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

Results

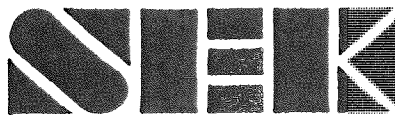
No significant differences as affected by tillage or N fertilization were found for grain sorghum yield in 1983 (Table 1). Dry growing conditions resulted in an overall mean yield of 45 bu/a. Soybean yields in 1984 were not affected by tillage but were affected by the residual effect of 1983 N fertilizer application. However, since drought conditions existed in 1984 as well as in 1983, these yield differences were small. Tillage and N fertilization options significantly interacted to affect grain sorghum yields in 1985. For both conventional and reduced tillage, the addition of N

(regardless of source) resulted in an approximately 20 bu/a increase in yield, compared to the check . However, with no-tillage, the application of anhydrous ammonia resulted in 40 bu/a higher yield than in the check and 10 to 20 bu/a higher yield than from the application of solid urea or UAN solution. Even though from different N sources, these data suggest that deep placement of N fertilizer may produce higher grain sorghum yields in no-tillage systems. The lower mean yields obtained with no-tillage as compared to reduced or conventional tillage systems in 1985 may have been due to increased weed competition. The lack of precipitation for over 3 weeks after application reduced the effectiveness of the preemergent herbicides. Soybean yields in 1986 were not affected by tillage or residual effects of grain sorghum N fertilization. The trend for lower yield in no- tillage areas may have been due to moderate weed pressure. In 1987, grain sorghum yields were affected by both tillage and N fertilization but no interaction was found. Yields were between 17 and 24 bu/a higher in conventional or reduced tillage than no-tillage areas. Yields were increased by 30, 50, and 62 bu/a above the check with the addition of UAN solution, urea, or anhydrous ammonia, respectively. Weed pressure in no-till areas was minimal in 1987, as evidenced by the 87 bu/a yields obtained with the application of anhydrous ammonia in those plots.

Table 1. Effect of Tillage and N Fertilization on Yields in a Grain Sorghum - Soybean Rotation.

Treatments	Yield					
	Grain Sorghum			Soybean		
	1983	1985	1987	1984	1986	
-----bu/a-----						
<u>Tillage</u>	<u>x</u>	<u>N Fertilization</u>				
Conventional	Check	45.1	81.3	37.6	5.6	18.4
	Anhydrous NH ₃ - knifed	47.5	99.5	94.0	6.1	21.2
	UAN solution - broadcast	47.9	98.3	66.0	5.4	18.6
	Urea solid - broadcast	46.8	102.6	81.6	6.5	20.6
Reduced	Check	46.2	80.0	38.7	5.3	19.2
	Anhydrous NH ₃ - knifed	48.0	101.2	95.1	5.0	18.4
	UAN solution - broadcast	43.2	100.6	70.7	6.2	18.5
	Urea solid - broadcast	46.7	98.6	97.7	7.7	17.4
No-tillage	Check	44.0	35.7	14.9	5.4	14.7
	Anhydrous NH ₃ - knifed	40.9	76.3	86.9	6.7	16.8
	UAN solution - broadcast	40.5	57.8	44.4	4.2	14.1
	Urea solid - broadcast	45.7	65.5	61.7	5.9	17.4
	LSD 0.05 (any comparison) ¹	NS	11.0	NS	NS	NS
	LSD 0.05 (same tillage)	NS	9.5	NS	NS	NS
<u>Means, Tillage</u>						
	Conventional	46.8	95.4	69.8	5.9	19.7
	Reduced	45.9	95.0	75.5	6.0	18.4
	No-tillage	42.8	58.8	52.0	5.5	15.7
	LSD 0.05	NS	7.3	11.6	NS	NS
<u>Means, N Fertilization</u>						
	Check	45.0	65.6	30.4	5.4	17.4
	Anhydrous NH ₃ - knifed	45.2	92.3	92.0	5.9	18.8
	UAN solution - broadcast	43.9	85.6	60.4	5.3	17.1
	Urea solid - broadcast	46.4	88.9	80.3	6.7	18.4
	LSD 0.05	NS	5.5	9.2	1.0	NS

¹Obtained from interaction of main effects not from single factor analysis



SOIL COMPACTION EFFECTS ON SOYBEAN AND GRAIN SORGHUM
AND SELECTED SOIL PROPERTIES¹

D. W. Sweeney, J. B. Sisson², and M. B. Kirkham²

Summary

In the first year of this study, the soil compaction regimes used did not affect yields of either soybean or grain sorghum.

Introduction

Claypan soils are typical in southeastern Kansas. Though some variation occurs, these soils have approximately 1 ft of silt loam overlying 3 ft or more of silty clay. Therefore, mechanical operations that affect the top 12" of soil may significantly impact plant growth and crop production. Soil compaction is one possible consequence of tillage and harvesting operations. Thus, the objective of this experiment was to determine the long-term effect of selected compaction systems on soybean and grain sorghum growth and yield and on soil properties.

Experimental Procedure

The experiment was established at the Columbus Field of the Southeast Kansas Branch Experiment Station in 1987. Five compaction systems comprised the whole plots of a split-plot experimental design. The compaction regimes include 1) entire area compacted, 2) wheel track compaction, 3) wheel track compaction that has received a subsequent chisel operation, 4) wet disc operation, and 5) no intentional compaction. Subplots were two soybean varieties, Williams 82 and Bay, and one grain sorghum variety, Pioneer 8585. Plots were compacted on March 20, 1987 by use of a four-wheel drive tractor with a total weight of 18640 lb. Double passes in the same track were made by the tractor. In addition, since the tire width was 20", side-by-side, double-passed tracks were used to make a 40" compacted area. These tracks were made perpendicular to the subsequent row planting. The chisel operation for designated wheel track treatments was done perpendicular to the wheel tracks on April 22 at a depth of 8" and on a spacing of 12". Wet disc operations were done on May 8 and June 2. All plots, including those receiving no intentional compaction, were disced and field cultivated on June 16. Soybeans and grain sorghum were

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planted on June 16 at approximately 140,000 and 66,000 seeds/a, respectively. Soybeans were fertilized with 153 lb/a of 6-24-24 applied as a side band with the planter. Grain sorghum was fertilized with a blend of 67 lb N/a as urea (46-0-0) and 145 lb/a of 6-24-24 applied as a side band with the planter.

Plots were harvested for yield. Yield components were determined from a sample taken from a 30 x 52" area within the plot. In addition, plant height at maturity, leaf area index, and dry weight were measured. Oxygen diffusion rates at 4" and gravimetric moisture content at 2-6" were measured in the soil.

Results

The compaction systems did not result in yield differences for soybeans or grain sorghum or in differences in most of the measured plant and soil parameters (data not shown). Oxygen diffusion rate on Sept. 30 was the only soil or plant response that was significantly affected by the five compaction systems. This study will be continued to determine long-term effects of annual compaction schemes.





EFFECT OF TIMING OF LIMITED IRRIGATION ON SOYBEANS
PLANTED AT TWO DATES

D.W. Sweeney and G.V. Granade

Summary

Limited irrigation did not significantly affect the yield of soybeans planted in early or late June. An interaction ($p < 0.10$) suggested that during 1987, irrigation may have been more important for late planted soybeans than for those planted in early June.

Introduction

Irrigation of soybeans is not extensive in southeastern Kansas. This is due, in part, to the lack of large irrigation sources. Limited irrigation, supplied by the substantial number of ponds in the area, could be used to help increase soybean yields. The objectives of this experiment were to determine the optimum reproductive growth stage for irrigation with a limited water supply and to determine if planting date affects the soybean response to irrigation.

Experimental Procedure

An experiment was established in 1987 to determine the effect of four irrigation schemes on yield of three soybean cultivar planted at two dates. The four irrigation schemes were no irrigation, 1" applied at the R1 growth stage (first bloom), 1" applied at the R4 growth stage (pod 0.75" long at one of four uppermost nodes), and 1" applied at R6 growth stage (full-sized green beans at one of the four uppermost nodes). The two planting dates were early and late June. The three soybean cultivars were Crawford, Douglas, and Sparks. The first planting date was June 9, 1987, and the second planting date was June 26, 1987. All cultivars were seeded at approximately 146,000 seed/a. All areas were fertilized with 112 lb/a of 6-24-24 on June 8, 1987. The soybeans planted at the first date were harvested on Oct. 9, 1987, and those planted at the second date were harvested on Oct. 22, 1987.

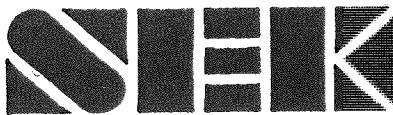
Results

Soybean yield was not significantly affected by irrigation scheme, planting date, or cultivar selection (Table 1) and averaged 38.7 bu/a. An interaction between planting date and variety showed that Sparks was little affected by planting date, whereas both Crawford and Douglas yielded approximately 2 to 3 bu/a less when planted in late June rather than in early June.

An interaction ($p < 0.10$) between irrigation scheme and planting date suggested that yields of the three cultivars were similar for the irrigation schemes when planted at the early date. However, when the three cultivars were planted in late June, they appeared to respond to the irrigation systems. Yields were increased by 3 to 6 bu/a when the soybeans received 1" of irrigation at the R1 and R6 reproductive growth stages, as compared to either no irrigation or irrigation at the R4 stage (data not shown). Even though rainfall occurred sporadically in 1987, the yields suggest that moisture stress periods were minimal. This study will be continued to evaluate response in years when rainfall and other environmental patterns may differ.

Table 1. Effect of Timing of Limited Irrigation on Yield of Soybean Planted at Two Dates.

Treatment	Yield
	bu/a
<u>Irrigation by growth stage</u>	
None	36.8
R1	39.6
R4	38.3
R5	39.9
LSD (0.05)	NS
<u>Planting Date</u>	
Early June	39.4
Late June	37.9
LSD (0.05)	NS
<u>Cultivar</u>	
Crawford	38.9
Douglas	38.4
Sparks	38.7
LSD (0.05)	NS
<u>Interaction(s)</u>	P x C I x P (0.10)



PERFORMANCE TESTING OF SMALL GRAIN VARIETIES

George V. Granade and Ted Walter¹

Summary

Wheat and barley were not planted in fall of 1986 because of wet weather, and spring oats, spring barley, and spring wheat were planted in early March, 1987. The spring small grains were harvested in late June. Spring oat varieties Ogle and Bates have a high yield potential. The spring barley yields averaged 29 bu/a, with Bovers having the highest yield of 40 bu/a. Yields of spring wheat were lower than those of winter wheat. The spring wheats do not appear very promising because of the warm humid conditions in early spring in southeastern Kansas, which increase the potential for diseases.

Introduction

The small grain variety tests are conducted to help southeastern Kansas growers select varieties best adapted for the area. Complete results are available in Kansas Agric. Expt. Stn. Report of Progress 537. The small grains tested in 1987 included spring oats, spring wheat, and spring barley. Winter wheat and barley were not tested in 1987 because of a wet fall.

Experimental Procedure

Eight spring oats, six spring wheats, and eight spring barley varieties were planted on March 6, 1987. Seeding rates were 1,080,000 seeds per acre for spring wheat, 70 lb. per acre for spring barley, and 90 lb. per acre for the spring oats and were fertilized with 75 lb. N per acre, 67 lb. P₂O₅ per acre, and 67 lb. K₂O per acre.

Spring Oats Results

Yields and yield components of spring oats are shown in Table 1. Average yield of the test was 37 bu per acre, and test weights averaged 24 lb per bushel. Yields ranged from 26 to 43 bu per acre, with Ogle being the highest yielding variety. Speckle leaf blotch was a problem this past spring, with Webster having the highest incidence of the disease and Ogle and Hazel having the lowest.

¹ Department of Agronomy, KSU.

Spring Barley Results

Yields for spring barley averaged 29 bu per acre (Table 2). Bowers was the highest yielding variety. Lud and Steptoe had the lowest lodging percentage. Lud and Otis are two-row barleys, whereas Bowers and Robust are six-row barleys. Robust is used for malting. These spring barleys have lower yields than winter barleys, thus, the potential of growing them in southeastern Kansas does not appear to be good.

Spring Wheat Results

Yields and yield components for spring wheat can be found in Table 3. The spring wheat averaged 32 bu/a and the highest yielding cultivar was Guard (37 bu/a). Protein content ranged from 14.4 to 15.3 percent.

Table 1. Yield and Yield Components of Spring Oats, 1987.

Variety	50 Percent Heading	Test Weight	Disease Rating ¹	1987 Yield	1985-87 Yield	Plant Height
	Mo. Day	Lb/bu	%	Bu/a	Bu/a	In
Bates	May 15	26.6	1.3	42.8	64.0	27
Don	May 14	23.5	2.8	31.4	----	24
Hazel	May 17	23.4	0.7	40.5	----	24
Lang	May 12	23.1	3.7	25.8	----	23
Larry	May 12	26.4	2.0	39.0	58.7	23
Ogle	May 16	24.8	0.7	56.2	71.1	26
Starter	May 12	25.0	3.7	34.7	----	25
Webster	May 11	23.1	4.3	26.0	55.0	25
LSD _(0.05)	1	2.2	1.5	5.5	----	2
Test Average		24.5	---	37.1	----	25

¹Rating on a scale of 0 to 5, with 0 being no disease and 5 completely diseased. Rated on May 18, 1987.

Planted: March 6, 1987

Harvested: June 25, 1987

Fertilizer: 75 lb N/a, 67 lb P₂O₅/a and 67 lb K₂O/a on October 20, 1987

Table 2. Yield and Yield Components of Spring Barley, 1987.

Variety	Maturity		Test	Disease	Lodging	1987	1985-87
	Mo.	Day	Weight Lb/bu	Rating ¹	%	Yield Bu/a	Yield Bu/a
Azure	May	28	30.2	2.0	10	7.8	--
Bovers	May	12	39.3	2.0	7	40.1	46.1
Hazen	May	11	41.1	3.3	5	37.0	--
Lud	May	14	42.7	3.0	3	38.6	44.0
Otis	May	10	39.5	5.0	10	23.2	33.9
Robust	May	11	42.1	2.7	5	28.1	38.1
Steptoe	May	13	30.7	2.7	3	26.0	--
Teton	May	12	35.4	3.7	5	28.6	--
LSD (.05)	1		4.2	0.7	ns	4.8	--
Test Average			37.6	3.0	6	28.7	--

¹Rated on a scale of 0 to 5, with 0 being no disease and 5 completely diseased. Rated on May 18, 1987.

Planted: March 6, 1987

Harvested: June 19, 1987

Fertilizer: 75 lb N/a, 67 lb P₂O₅/a and 67 lb K₂O/a on October 20, 1986.

Table 3. Yield and Yield Components of Spring Wheat, 1987.

Variety	Maturity		Test	Protein	1987	1985-87	Plant
	Mo.	Day	Weight Lb/bu	Content %	Yield Bu/a	Yield Bu/a	Height In
Guard	May	12	57.7	14.4	37.3	30.2	27
Marshall	May	14	55.0	14.9	36.5	--	26
Norseman	May	16	54.1	14.9	33.4	--	24
Olso	May	9	54.8	15.3	24.3	26.8	25
Stoa	May	16	54.8	14.5	32.5	--	30
Wheaton	May	13	52.5	15.0	27.5	--	24
LSD (.05)	1		2.6	0.5	2.0	ns	1
Test Average			54.8	14.8	32.0	28.5	26

Planted: March 6, 1987

Harvested: June 25, 1987

Fertilizer: 75 lb N/a, 67 lb P₂O₅/a and 67 lb K₂O/a on October 20, 1987

CORN HYBRID PERFORMANCE TEST

George V. Granade, Kenneth Kelley, and Ted Walter¹

Summary

A corn performance test was planted in Montgomery County under irrigated and dryland conditions to determine the top corn hybrids in southeastern Kansas. Several hybrids have potential for southeastern Kansas with irrigation. However, this is the first year for the dryland test and more results are needed to make any conclusions about which hybrids respond best to the dryland condition.

Introduction

Corn hybrids are grown in southeastern Kansas in both dryland and irrigated conditions. Determining which hybrids will perform best in southeastern Kansas is of prime importance to area farmers with and without irrigation facilities.

Experimental Procedure

In 1987, 48 corn hybrids were planted in an off-station test with and without irrigation. The corn was planted on April 9 in 30-inch rows in Montgomery County. The irrigated corn was watered on June 15 and June 16 with 1 inch of water on each day. The irrigated test was thinned to a plant population of 24,600 plants/a, and the dryland test was thinned to 16,100 plants/a. Corn from both tests was harvested on September 2.

Results

Moisture was very good for most of the growing season. The irrigated test averaged 156 bu per acre, with a range of 139 to 174 bu per acre. Table 1 shows the yields and yield components of some of the highest yielding corn hybrids in the irrigated test. The dryland test averaged 130 bu per acre in response to the excellent growing conditions. Table 2 shows the yields and yield components of the highest yielding corn hybrids in the dryland test. Complete results are compiled in Kansas Agric. Expt. Stn. Report of Progress 529.

¹ Department of Agronomy, KSU.

Table 1. Irrigated Corn Hybrids Yields, Montgomery County, 1987

Brand	Hybrid	Yield			Test Weight	Days to Silting
		1987	2-yr.	3-yr.		
		-----Bu/a-----			Lb/bu	
Asgrow/O's Gold	RX 860	174	173	---	59	69
Jacques	7950	174	---	---	57	71
SeedTec/Wac	915	171	164	157	59	70
Triumph	1650 FG	168	---	---	60	71
Warner	W-2192-A	168	162	---	58	70
Bo-Jac	905	166	162	158	59	72
Northrup King	5225 Exp.	166	---	---	58	71
Cargill	8717	165	---	---	59	71
Funk's	G-4513	164	---	---	61	70
Golden Acres	T-E 6994	164	168	152	59	70
Jacques	8210	164	---	---	60	70
Cargill	SX 352	163	---	---	59	70
Garst	8315	163	170	---	59	74
Golden Acres	T-E 6996	163	164	162	59	72
Funk's	G-4626	162	158	---	60	71
Cargill	7990	159	---	---	58	74
Nebraska	611	159	159	144	57	71
Ohlde	230	159	---	---	60	71
Oro	Oro 180	159	---	---	58	70
SeedTec/Wac	H-2686 A	159	---	---	58	72
Jacques	8400	158	168	164	59	72
Cargill	7877	157	---	---	57	71
Ohlde	242	157	---	---	59	71
Garst	8344	156	170	---	61	71
Northrup King	PX 9584	156	155	---	59	73
Oro	Oro 150	156	---	---	59	71
Triumph	1595	156	160	150	60	71
SeedTec/Wac	920 D	155	153	---	60	71
Warner	W-2192	155	162	---	59	71
Golden Acres	T-E 6988	154	152	---	60	70
Asgrow/O's Gold	RX 892	153	161	156	57	70
Cargill	971	153	161	---	59	70
Triumph	2020	153	---	---	59	72
Test Mean		156	158	150	59	71

Planted: April 7, 1987

Harvested: September 2, 1987

Fertilizer: 140 lb N/a; 90 lb P₂O₅/a; 60 lb K₂O/a. Applied before planting.

Herbicide: Aatrex at a rate of 2 lb/a and Lasso at a rate of 4 qt/a.

Irrigation and Amounts: June 15 and June 16 with 1 inch each day.

Table 2. Dryland Corn Hybrids Yields, Montgomery County, 1987

Brand	Hybrid	1987	Test	Lodging	Days to
		Yield	Weight		
		Bu/a	Lb/bu	%	
Cargill	8717	154*	58	0	72
Nebraska	611	152*	57	1	71
Cargill	7990	151*	58	0	72
Jacques	7950	151*	58	1	70
Garst	8315	147*	59	1	73
Bo-Jac	590	145*	58	0	71
Cargill	7877	140*	58	0	71
Oro	Oro 150	140*	60	0	71
SeedTec/Wac	H-7750	139*	59	0	72
Agrow/O's Gold	RX 860	138*	58	0	70
Golden Acres	T-E 6996	136	59	0	71
Jacques	8210	136	59	0	71
DeKalb	DK 711	135	59	1	72
Funk's	G-4673B	135	60	2	72
Northrup King	5225 Exp.	135	58	0	72
Agrow/O's Gold	RX 788	132	60	0	71
Golden Acres	T-E 6994	132	58	0	72
SeedTec/Wac	915	132	58	0	71
Triumph	1595	132	60	0	71
Cargill	7993	131	61	0	71
Jacques	7900	130	60	0	71
Jacques	7820	130	61	0	71
Agrow/O's Gold	RX 892	129	58	0	70
Northrup King	PX 9540	129	50	0	72
Test Mean	130	59	0	71	
LSD(.05)	17	1	1	1	

*Upper L.S.D. group. Differences among these values marked with asterisk are not statistically significant.

Planted: April 7, 1987

Harvested: September 2, 1987

Fertilizer: 140 lb N/a; 90 lb P₂O₅/a; 60 lb K₂O/a. Applied before planting.

Herbicide: Aatrex at a rate of 2 lb/a and Lasso at a rate of 4 qt/a.



SOYBEAN VARIETY PERFORMANCE TEST

G. V. Granade and W. T. Schapaugh¹

Summary

Soybeans from maturity groups III, IV, and V were planted in mid-June at the Columbus Field of the Southeast Kansas Branch Station. Weather conditions were good for soybean growth during the early part of the growing season, but were dry for July and August. Maturity group V soybean varieties continue to show the most consistently high yields in southeastern Kansas. The group III soybeans had low yields because of charcoal rot and the dry conditions during July and August when these soybeans began to bloom and set pods.

Introduction

Soybeans are an important crop for southeastern Kansas, which has approximately one-third of the state's acreage. Testing and developing varieties that are adapted to the area is of prime importance to local farmers.

Experimental Procedure

Maturity groups III, IV, and V were tested in 1987 at the Columbus Field. Soybeans were planted on June 10 in 30-inch rows with a John Deere Maxi-merge planter equipped with cones.

Results

Moisture was good during some of the growing season, but rainfall was low in July and August. Yields were good for maturity group V soybeans, with a test average of 28 bu per acre. However, the group III and IV soybean's yields were much lower. Some of the more commonly grown varieties are listed in Table 1. Complete variety results are compiled in Kansas Agric. Expt. Stn. Report of Progress 533.

¹ Department of Agronomy, KSU.

Table 1. Soybean Cultivar Yields, Columbus Field, 1987.

Brand	Variety	Maturity Group	1987 Yield Bu/a	1986-87 Yield Bu/a	1985-87 Yield Bu/a
Merschman	Washington V	III	19.0	----	----
NeCo	B-3	III	19.9	----	----
Ohlde	O-3257	III	18.3	----	----
Prize	622	III	19.3	----	----
Terra	Triumph	III	18.7	----	----
	Williams 82	III	21.0	17.6	24.6
	Zane	III	19.0	15.7	24.2
	Test mean		18.6		
	LSD _(0.05)		NS		
Asgrow	A 4595	IV	22.0	17.8	26.2
	Crawford	IV	23.9	19.4	25.6
	C 1653	IV	21.1	----	----
DeLange	DS 42	IV	22.1	17.2	----
Merschman	Dallas	IV	27.5	23.6	----
NeCo	1350	IV	29.3	25.3	30.5
Northrup King	S42-30	IV	25.7	----	----
Ohlde	O-4386	IV	24.8	22.7	29.7
	Stafford	IV	22.5	24.5	----
Stine	4190	IV	25.7	22.6	----
Terra	Competitor	IV	24.1	----	----
	Test mean		23.5		
	LSD _(0.05)		5.6		
	Bay	V	27.2	27.8	32.2
	Essex	V	29.3	26.9	31.9
	Forrest	V	26.1	33.2	35.6
	Hutcheson	V	28.4	31.2	34.4
	K1130	V	28.3	----	----
	K1133	V	30.1	----	----
Northrup King	S53-44	V	25.0	----	----
	Pershing	V	27.2	26.3	32.6
	Toano	V	30.4	30.0	33.4
	Test mean		27.6		
	LSD _(0.05)		3.0		

Planted: June 10, 1987.

Herbicide: 0.33 lb Lexone DF/a + 1.5 pt Dual/a.



MATURITY GROUP V AND VI SOYBEAN VARIETIES

George V. Granade

Summary

Soybean varieties from maturity groups V and VI were obtained from private and public sources and planted in early June. Several maturity group V soybeans, which are not currently marketed in the area, have potential for southeastern Kansas. Maturity group VI soybeans yields were slightly less than those of group V soybeans.

Introduction

Many maturity group V soybean varieties are not currently grown in southeastern Kansas. Some private companies have not promoted these soybeans in the area. The possibility also exists that maturity group VI soybean varieties might be grown.

Experimental Procedure

Soybeans varieties from maturity group V and VI were obtained from public and private breeders. These were planted at the Columbus field on 20 May in 30-inch rows with eight viable seeds per foot in a linear row (139,000 seeds per acre). Sencor DF at the rate of 0.33 lb/a and Dual at the rate of 1.5 pt/a were applied after planting.

Results

Soybean yields ranged from 20 to 32 bu per acre, with Toano, a group V soybean, having the highest yield (Table 1). The highest yielder in group VI was Eagle Seed's HSC B2J, with 31 bu per acre. Two-year averages ranged from 15 to 30 bu per acre, and 3-year averages ranged from 20 to 32, with Forrest having the highest yield (Table 1).

Table 1. Maturity Group V and VI Soybean Cultivars Yield and Yield Components, Columbus Field, 1987.

Brand-Variety	Maturity Group	Yield				Plant Height	Maturity	Number of seeds /lb	Lodging score
		1987	2-year	3-year	4-year				
		-----Bu/a-----				In	Mo-day		
Asgrow A 4906	V	24.4	----	----	----	34	9-26	4620	1
Asgrow A 5149	V	29.2	----	----	----	30	10- 2	2800	1
Asgrow A 5474	V	29.1	----	----	----	37	10- 1	3410	1
Asgrow A 5980	V	31.7	----	----	----	41	10- 4	3230	3
--- Avery	V	24.8	----	----	----	41	9-28	3630	1
--- Bay	V	28.5	26.7	31.3	26.3	37	10- 2	2950	2
Coker 425	V	24.8	24.6	29.5	24.2	25	9-29	3620	1
Coker 485	V	29.3	28.1	31.1	----	35	10- 7	2940	2
Coker RA 451	V	20.3	15.1	20.1	----	35	10- 2	3080	1
Coker RA 452	V	22.4	----	----	----	30	9-27	4750	1
Escob 3	V	20.9	----	----	----	35	9-30	3690	1
--- Essex	V	24.0	19.1	23.3	18.8	27	9-27	4180	1
--- Forrest	V	30.4	30.2	32.9	27.4	32	10- 2	3980	1
Hartz H 5164	V	22.5	23.6	----	----	30	10- 7	3220	1
Hartz H 5171	V	27.7	25.7	29.1	----	37	10-11	3320	3
Hartz H 5252	V	26.3	26.4	29.8	----	33	10- 5	3540	1
Hartz H 5370	V	30.4	----	----	----	39	10- 3	4280	2
--- K77-50-53	V	23.7	21.4	25.9	----	34	10- 1	3790	1
--- K77-50-63	V	23.0	----	----	----	29	9-28	3980	1
--- Pershing	V	25.4	25.4	28.7	----	27	9-27	4380	1
--- Toano	V	32.2	----	----	----	32	9-29	3450	1
Yield King 503	V	26.0	22.8	26.0	----	39	10- 2	3790	2
Yield King 577	V	28.3	27.8	----	----	37	10- 2	3580	3
Asgrow A6242	VI	26.2	26.6	----	----	37	10-18	3260	1
--- Bradley	VI	26.1	25.8	27.8	22.5	30	10- 8	4210	2
Coker RA 604	VI	24.4	25.8	28.1	----	36	10-13	3220	1
Coker RA 606	VI	26.0	----	----	----	43	10-15	3570	2
--- Davis	VI	24.9	25.2	25.8	20.5	36	10-14	3270	1
Hartz 6130	VI	22.7	27.4	29.6	----	39	10-18	3690	1
Hartz X6200	VI	28.6	----	----	----	37	10- 9	2850	1
HSC Baldwin	VI	19.8	----	----	----	40	10-24	3620	1
HSC B2J	VI	30.8	----	----	----	35	10- 9	3320	1
--- Tracy M	VI	20.2	21.0	24.2	19.4	37	10-22	3100	2
Yield King 593	VI	29.1	28.3	----	----	37	10-13	3130	1
Yield King 613	VI	23.6	24.6	----	----	47	10-11	4110	2
Yield King 696	VI	15.3	19.6	----	----	35	10-27	3540	1
L. S. D. . . .		4.9				4	3	476	0.7
Test mean		25.4				34		3620	1
C. V. (%)		11.8				7.4		8.6	29.8

Planted: May 20, 1987.

Herbicide: 0.33 lb/a of Metribuzin + 1.5 pt/a Dual on May 21, 1987.

Fertilizer: none.

Soil Test: pH 5.6; P 33 lb/a; K 150 lb/a. Sampled November, 1987.

PERFORMANCE OF POPCORN HYBRIDS

G. V. Granade, J. P. Shroyer¹, and J. K. Brotemarkle¹

Summary

An irrigated popcorn performance test was planted in early April near McCune to examine the potential of growing popcorn in southeastern Kansas. Yields ranged from 3170 to 4920 lb per acre, with P410 having the highest yield. Popping quality ranged from 32 to 35 cc/g; thus, this was generic popcorn.

Introduction

Alternative crops are being sought to provide some relief from the poor economic situation in agriculture. One possible crop to grow in southeastern Kansas is popcorn. Popcorn could probably be grown on the same ground as field corn with irrigation. The objective of this test was to examine the yield potential of popcorn with irrigation in southeastern Kansas.

Experimental Procedures

Eight popcorn hybrids were obtained and planted on April 7 in 30-inch rows at Mr. Vernon Egbert's farm near McCune. Popcorn was planted at a target population of 23,200 plants per acre. Popcorn was irrigated on June 23 with 1 inch of water. Data collected include mid-silk date, plant population, percent lodging, test weight, number of kernels per 10 grams, and yield per acre. After harvesting, a popping test was conducted to determine the quality of the popcorn. This was done by weighing 250 grams of seeds and placing them in a Cretors' popper at 480°F in a half a cup of coconut oil. After popping, the volume was measured. Generic popcorn has a popping quality of 32 cc/g or higher.

Results

Rainfall was good until late July, when conditions became dry and one irrigation application was applied. P410 had the highest yield, and 03196, 12164, and P203 had the highest popping quality (Table 1). Lodging was high for all hybrids, with 03196 and 8365 having the lowest percentage.

¹ Department of Agronomy, KSU.

Table 1. Yield and Yield Components of Popcorn Varieties, McCune, 1987.

Variety	Yield ^a lb/a	Lodging %	Test		Silk Date month day	Popping Quality cc/g	Number of Kernels /10g
			Weight lb/bu	Population plants/a			
IOPOP 12	3822	40	67.0	23,390	July 20	31.6	77
P203	3474	25	65.8	24,700	July 20	33.8	78
P405	3172	34	66.6	23,130	July 19	33.5	77
P410	4918	70	64.4	26,830	July 20	32.5	65
P608	3984	48	66.6	23,440	July 20	32.9	68
8365	3182	19	66.8	22,520	July 19	33.0	68
03196	3557	19	66.4	23,390	July 20	35.0	77
12164	3402	74	65.6	26,270	July 18	35.0	74
LSD _(0.01)	823	17	0.6	2,199	1	2.0	8
Test mean	3679	41	66.4	24,190		33.4	73

^a Yield is adjusted to 15.5 per cent moisture.

Planted: April 7, 1987.

Herbicide: 1.5 qt Atrazine + 1.5 qt Micro-Tech Lasso/a preplant incorporated.

Fertilizer: 180 lb N/a, 90 lb P₂O₅/a, and 90 lb K₂O/a.

Irrigation: 1 inch on June 23, 1987.

Cultivation: May 14, 1987.

Harvested: September 3, 1987.



SOYBEAN CULTIVARS DOUBLECROPPED AFTER WHEAT
IN DIFFERENT TILLAGE SYSTEMS IN SOUTHEASTERN KANSAS¹

G.V. Granade, D.W. Sweeney, and W.T. Schapaugh²

Summary

A common practice in Southeast Kansas is doublecropping soybeans after wheat when soil moisture and time are available. In 1985, a study was initiated to examine the effect of different tillage systems on 12 soybean cultivars after wheat. In 1987, soybean yields were significantly different for tillage systems and soybean cultivars.

Introduction

Doublecropping of soybeans in southeastern Kansas is a common practice, when time and soil moisture are available. Selecting the best cultivar is usually based on the results from the soybean performance report, which is for full-season soybeans. Several states have reported that the results from the performance report can be used for doublecrop systems; however, other states have indicated there are differences. A study was initiated in 1985 to examine the response of different soybean cultivars after wheat in three different tillage systems.

Experimental Procedures

Wheat was planted in the fall of 1985, 1986, and 1987 at the recommended rate and harvested in mid- to late June. After wheat harvest, three tillage systems were established: a) burn (burn wheat stubble, disc several times); b) minimum tillage (disc twice with offset disc); and c) no-tillage. Twelve soybean cultivars from three maturity groups (Table 1) were planted in 30-inch rows with a John Deere Maxi-emerge planter modified with cone. In 1985, the study was planted at the Parsons and Columbus fields; in 1986, at the Parsons Field; and in 1987, at the Columbus Field. In all years, wheat was planted at a different site and was not in a continuous, wheat doublecrop soybean system.

Soybeans were planted at a target population of 139,000 plants per acre (8 seeds/foot). Data collected were stand count, plant height, maturity, number of seeds per pound, and yield. Number of seed per pound was determined by the conversion of 100-seed weight.

¹ This research is supported by a grant from the Kansas Soybean Commission.

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In June, 1986 before wheat harvest at Parsons, plots were re-established to determine if the previous soybean cultivar and tillage system had any effect on subsequent wheat yields and yield components. Yield components determined were percent stand, test weight, and percent protein.

Results

Soybean Yields

Yield and yield components for 1985 and 1986 are shown in table 2. In 1985, there was a significant difference in yield at the Parsons ($P < 0.10$) and Columbus ($P < 0.05$) locations from the interaction of soybean cultivar and tillage system. Some soybean cultivars at both locations did better in one tillage system than in another. Bay, at both locations, had its highest yields in the burn system, whereas Coker 393 had its highest yields in the minimum and no-tillage systems. In 1986, yields were lower than in 1985 because of the rainfall pattern. Tillage systems and the interaction of soybean cultivar X tillage systems did not significantly affect yield or maturity. Although not significant, there was a trend for the interaction of soybean cultivar X tillage system to influence yield as it did in the Parsons' 1985 data. Plant population was significantly different for tillage systems at Parson in 1985 and 1986. The no-tillage system had a significantly lower population than either the burn or minimum systems. This was probably due to poor soil to seed contact, resulting from straw residue that was either mixed in or left on the soil surface. Significant differences for yield, maturity, and plant population among soybean cultivars were found in 1985 and 1986 (Table 2). The highest yielding cultivar was Bay.

Yield and yield components for 1987 are shown in Table 3. Significant differences in yield, plant population, and seed size were measured for soybean cultivars and tillage systems. Northrup King S44-77 was the highest yielding cultivar, whereas Pioneer 9442 had the highest population. Zane produced the largest seed. The minimum system had the highest yield and plant population, whereas the no-tillage system produced the largest seeds. The interaction of soybean cultivar X tillage system did not significantly affect yield, plant population, or seed size.

Wheat Yield

Wheat yields and yield components were not significantly affected by the previous soybean cultivar, tillage system, or their interaction (Table 4). Although not significant, the previous no-tillage system tended to result in the highest yields and stand, but a lower protein content. Highest wheat yields were measured where the previous soybean cultivars were Crawford and NK S42-40, whereas wheat yields were lowest where Williams 82, Essex, and Pershing had been grown the previous year. This suggests a possible allelopathic effect from certain cultivars.

Table 1. Soybean Cultivars Planted in 1985, 1986, and 1987.

Soybean Cultivar	Maturity Group	1985	1986	1987
Coker 393	III	Yes	Yes	Yes
Sherman	III	No	No	Yes
Williams 82	III	Yes	Yes	Yes
Zane	III	Yes	Yes	Yes
Crawford	IV	Yes	Yes	No
Merschman Dallas	IV	No	No	Yes
Northrup King S42-40	IV	Yes	Yes	No
Northrup King S44-77	IV	No	No	Yes
Pioneer 9441	IV	Yes	Yes	No
Pioneer 9442	IV	No	No	Yes
Sparks	IV	Yes	Yes	No
Stafford	IV	No	No	Yes
Bay	V	Yes	Yes	No
Essex	V	Yes	Yes	No
K 1130	V	No	No	Yes
K 1133	V	No	No	Yes
K 77-50-53	V	Yes	Yes	No
Narov	V	Yes	Yes	No
Pershing	V	Yes	Yes	Yes
Toano	V	No	No	Yes

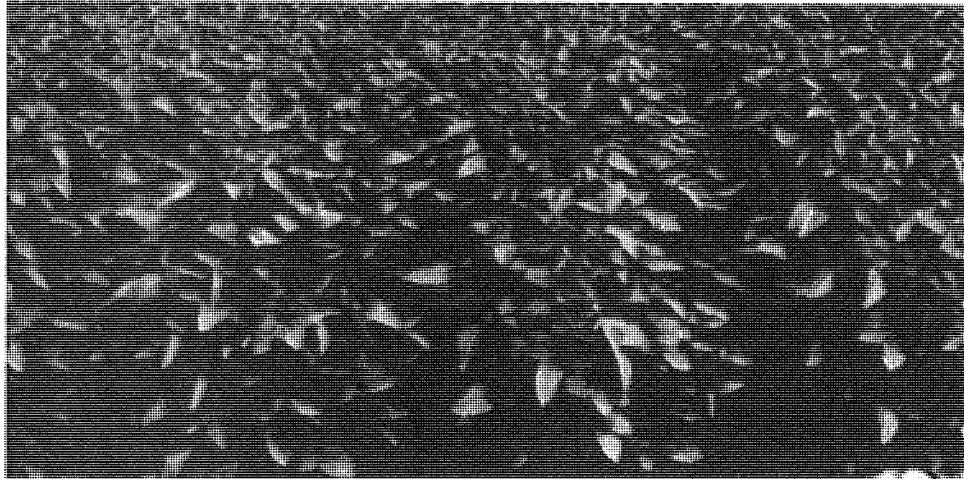


Table 2. Doublecropped Soybean Yields and Yield Components as Affected by Cultivar and Tillage Systems Following Wheat, Parsons and Columbus, 1985 and 1986.

Soybean Cultivar	Tillage System	Yield			Maturity			Population		
		1985		1986	1985		1986	1985		1986
		Parsons	Columbus	Parsons	Parsons	Columbus	Parsons	Parsons	Columbus	Parsons
		-----bu/A-----			-----Julian Day-----			-----Plants/A-----		
Coker 393	Burn	31.8	8.1	4.8	274	270	262	109,400	51,700	104,500
	Minimum	37.1	14.5	5.4	276	271	263	92,000	54,400	110,400
	No-tillage	38.1	14.2	6.2	275	270	276	82,000	56,800	77,400
Williams 82	Burn	28.1	9.4	6.9	273	271	267	82,500	39,500	111,300
	Minimum	34.3	11.3	6.5	275	272	262	85,400	32,400	83,200
	No-tillage	34.6	11.2	5.8	276	270	276	64,900	34,300	63,900
Zane	Burn	30.6	10.5	5.6	263	267	259	85,700	34,800	72,600
	Minimum	36.6	7.0	6.6	268	268	259	74,500	27,000	55,200
	No-tillage	32.5	10.5	8.1	271	267	262	60,000	31,800	43,600
Crawford	Burn	37.0	15.0	8.7	286	289	289	79,600	20,800	94,900
	Minimum	34.4	16.4	7.5	287	289	292	66,800	25,200	80,300
	No-tillage	30.3	19.8	7.9	289	283	301	57,600	29,500	46,500
NK S42-40	Burn	35.6	14.7	7.3	279	274	263	91,000	28,400	107,400
	Minimum	38.7	8.7	8.9	284	273	263	98,000	30,200	77,400
	No-tillage	37.5	15.1	7.9	283	272	281	54,900	41,200	57,100
Pioneer 9441	Burn	34.1	9.2	7.5	275	272	271	90,500	30,800	119,100
	Minimum	38.8	9.7	6.8	281	271	264	91,700	34,000	97,800
	No-tillage	38.4	10.6	5.2	280	272	286	80,800	36,600	77,400
Sparks	Burn	29.9	6.1	5.7	281	271	267	78,400	31,200	125,800
	Minimum	40.0	5.1	6.8	287	270	263	66,300	20,400	92,900
	No-tillage	29.8	11.8	6.3	288	270	276	42,100	35,100	66,800
Bay	Burn	40.0	32.7	14.8	296	295	302	113,300	46,800	98,700
	Minimum	34.1	26.5	15.3	296	295	305	77,200	45,300	78,400
	No-tillage	34.8	26.4	16.0	296	295	304	74,500	48,300	62,000
Essex	Burn	29.4	23.4	10.0	291	290	306	110,100	54,400	114,200
	Minimum	35.0	18.2	8.9	294	290	304	83,500	49,300	84,200
	No-tillage	33.4	17.6	8.3	298	290	305	81,600	60,200	42,100
K77-50-53	Burn	31.6	24.2	9.2	297	294	307	77,200	35,300	117,100
	Minimum	36.4	17.2	10.5	301	294	307	91,200	21,200	86,200
	No-tillage	36.1	25.1	10.3	303	295	307	65,100	38,900	62,900

Table 2. continued.

Soybean Cultivar	Tillage System	Yield			Maturity			Population			
		1985		1986	1985		1986	1985		1986	
		Parsons	Columbus	Parsons	Parsons	Columbus	Parsons	Parsons	Columbus	Parsons	
		-----bu/A-----			-----Julian Day-----			-----Plants/A-----			
Narow	Burn	36.3	24.4	14.8	292	294	302	118,100	33,400	88,100	
	Minimum	34.3	29.5	12.3	294	289	302	89,500	49,700	67,800	
	No-tillage	31.7	31.1	13.7	296	293	304	56,900	56,100	38,700	
Pershing	Burn	34.8	27.8	9.5	291	292	303	128,000	47,000	86,200	
	Minimum	34.0	23.0	8.7	293	291	303	98,000	47,100	80,300	
	No-tillage	36.8	28.0	11.4	292	292	304	92,200	58,000	49,400	
	LSD(.05)	NS	6.7	NS	NS	NS	10	NS	NS	NS	
	LSD(.10)	7.1	--	NS	NS	NS	--	NS	NS	NS	
<u>Main Effects</u>											
82	Coker 393	35.7	12.3	5.4	275	270	267	94,500	54,300	97,400	
	Williams 82	32.3	10.7	6.4	275	271	268	77,600	35,400	86,200	
	Zane	33.2	9.3	6.8	268	267	260	73,400	31,200	57,100	
	Crawford	33.9	17.1	8.1	288	287	294	68,000	25,200	73,900	
	NK 542-40	37.2	12.8	8.0	282	273	269	81,300	33,300	80,700	
	Pioneer 9441	37.1	9.8	6.5	279	272	274	87,900	33,800	98,100	
	Sparks	33.2	7.7	6.3	285	270	269	62,300	28,900	95,200	
	Bay	36.3	28.5	15.4	296	295	304	88,300	46,800	79,700	
	Essex	32.6	19.7	9.2	294	290	305	91,700	54,600	84,900	
	K77-50-53	34.7	22.2	10.0	300	294	307	77,800	31,800	88,700	
	Narow	34.1	28.4	13.6	294	292	303	88,200	46,400	64,900	
	Pershing	35.2	26.2	9.9	292	292	303	106,100	50,700	72,000	
		LSD(.05)	NS	3.4	2.1	2	2	5	15,200	8,800	17,500
		Burn	33.3	17.1	8.7	283	282	283	97,000	37,800	103,300
		Minimum	36.1	15.6	8.7	286	281	282	84,500	36,400	82,800
	No-tillage	34.5	18.5	8.9	287	281	290	67,700	43,900	57,700	
	LSD(.05)	NS	NS	NS	1	NS	NS	13,700	NS	23,200	

Table 3. Soybean Yields and Yield Components as Influenced by Soybean Cultivar and Tillage Systems Following Wheat, Columbus, 1987.

Soybean Cultivar	Tillage System	1987 Yield Bu/A	Number of Seeds /Lb	Plant Population Plants/A	LAI*	Maturity Mo Day
Coker 393	Burn	20.9	3290	94,860	1.68	9 24
	Minimum	22.9	3460	108,900	2.21	9 22
	No-tillage	15.3	3240	100,430	1.55	9 24
Sherman	Burn	19.0	3420	95,110	1.94	9 22
	Minimum	22.5	3080	113,500	2.33	9 25
	No-tillage	14.9	3460	105,270	1.99	9 23
Williams 82	Burn	19.9	3140	84,940	2.40	9 25
	Minimum	26.1	3100	94,380	2.44	9 25
	No-tillage	19.6	2980	95,590	1.62	9 26
Zane	Burn	16.9	2580	93,170	1.55	9 23
	Minimum	23.8	2550	104,790	1.82	9 23
	No-tillage	16.7	2590	87,120	1.38	9 24
Merschman Dallas	Burn	22.4	3220	89,540	1.71	9 30
	Minimum	28.0	3030	100,670	2.42	10 01
	No-tillage	19.7	3030	96,070	1.91	10 01
Northrup King S44-77	Burn	27.5	3310	107,690	1.98	9 27
	Minimum	33.7	3180	129,950	2.36	9 26
	No-tillage	26.7	3310	121,240	2.40	9 26
Pioneer 9442	Burn	22.8	3310	115,190	2.36	9 27
	Minimum	29.3	3310	135,760	2.70	9 28
	No-tillage	22.4	2840	117,850	1.78	9 29
Stafford	Burn	20.8	3630	50,340	1.46	10 02
	Minimum	32.8	3800	104,300	2.61	10 05
	No-tillage	24.3	3400	76,960	1.72	10 06
K 1130	Burn	26.3	4480	70,180	1.68	10 05
	Minimum	28.9	4380	74,290	2.03	10 09
	No-tillage	25.3	4140	78,170	2.30	10 10
K 1133	Burn	25.9	3920	80,100	2.41	10 07
	Minimum	27.9	4100	107,210	3.55	10 10
	No-tillage	25.0	3990	100,910	3.37	10 14
Pershing	Burn	25.9	4680	117,370	2.67	10 05
	Minimum	26.2	4270	120,520	2.72	10 04
	No-tillage	23.1	4400	111,800	3.02	10 10
Toano	Burn	29.1	3430	109,870	3.97	10 08
	Minimum	29.3	3190	113,260	4.56	10 11
	No-tillage	27.2	3180	112,050	3.63	10 17
	LSD(<i>e.o.s.</i>)	ns	ns	ns	ns	3

Table 3. Continued.

Soybean Cultivar	Tillage System	1987 Yield Bu/A	Number of Seeds /Lb	Plant Population Plants/A	LAI*	Maturity Mo Day
Main Effects						
Coker 393		19.7	3330	101,400	1.81	9 24
Sherman		18.8	3320	104,620	2.09	9 23
Williams 82		21.9	3070	91,640	2.15	9 25
Zane		19.1	2580	95,020	1.58	9 23
Herschman Dallas		23.4	3090	95,430	2.01	10 01
Northrup King S44-77		29.3	3270	119,630	2.25	9 26
Pioneer 9442		24.8	3150	122,940	2.28	9 28
Stafford		26.0	3610	77,200	1.93	10 04
K 1130		26.9	4330	74,210	2.00	10 08
K 1133		26.3	4000	96,070	3.11	10 10
Pershing		25.1	4450	116,560	2.80	10 06
Toano		28.6	3260	111,720	4.05	10 12
	LSD(.05)	3.1	209	10,824	0.71	2
	Burn	23.1	3530	92,360	2.15	9 29
	Minimum	27.6	3450	108,960	2.65	9 30
	No-tillage	21.7	3380	100,290	2.22	10 02
	LSD(.05)	ns	ns	10,662	0.25	1
	LSD(.10)	3.9	108	--	--	--
Test mean		24.2	3460	100,540	2.34	
C.V. (%)		13.5	6	11	32.3	

* LAI -- Leaf Area Index, taken at R6 growth stage.

Planted: June 16, 1987.

Herbicide: .33 lb Lexone DF + 1.5 pt Dual/a on June 16, 1987.

Table 4. Wheat Yields and Yield Components as Influenced by Previous Soybean Cultivar and Tillage System, Parsons, 1986.

<u>Soybean Cultivar</u>	<u>Tillage System</u>	<u>Wheat Yield</u> bu/a	<u>Wheat Protein</u> %	<u>Test Weight</u> lb/bu	<u>Stand</u> %
Coker 393	Burn	26.3	14.7	55.7	60
	Minimum	31.8	15.9	54.8	65
	No-tillage	32.2	14.8	55.6	62
Williams 82	Burn	25.8	15.7	54.5	58
	Minimum	27.6	16.6	53.6	52
	No-tillage	34.7	14.8	55.2	80
Zane	Burn	32.6	15.0	55.4	68
	Minimum	34.4	15.3	54.6	72
	No-tillage	31.6	16.3	53.9	70
Crawford	Burn	36.4	15.0	54.9	85
	Minimum	32.9	15.2	55.6	80
	No-tillage	35.8	14.5	55.1	78
NK S42-40	Burn	35.4	15.5	54.8	75
	Minimum	34.9	14.6	55.6	80
	No-tillage	28.8	15.1	52.9	72
Pioneer 9441	Burn	28.6	15.7	53.9	70
	Minimum	28.4	15.4	54.0	82
	No-tillage	34.6	14.8	55.0	78
Sparks	Burn	29.8	15.2	55.4	65
	Minimum	33.9	15.9	55.0	78
	No-tillage	31.9	15.5	54.2	82
Bay	Burn	32.0	15.7	55.7	68
	Minimum	30.7	15.5	53.6	75
	No-tillage	32.4	14.8	55.8	62
Essex	Burn	23.4	15.7	53.0	50
	Minimum	34.7	15.7	54.6	72
	No-tillage	31.5	15.0	54.8	85
K77-50-53	Burn	31.9	16.2	54.8	75
	Minimum	31.5	14.9	55.4	75
	No-tillage	31.8	15.2	53.2	85
Narov	Burn	31.4	15.6	55.0	80
	Minimum	27.8	15.4	53.4	62
	No-tillage	34.7	14.3	54.6	78
Pershing	Burn	30.2	15.9	54.4	75
	Minimum	29.8	15.1	54.3	62
	No-tillage	29.6	15.4	54.2	82
	LSD(.05)	NS	NS	NS	NS

Table 4. Continued.

<u>Soybean</u> <u>Cultivar</u>	<u>Previous</u> <u>Tillage</u> <u>System</u>	<u>Wheat</u> <u>Yield</u> bu/a	<u>Wheat</u> <u>Protein</u> %	<u>Test</u> <u>Weight</u> lb/bu	<u>Stand</u> %
<u>Main Effects</u>					
Coker 393		30.1	15.1	55.4	62
Williams 82		29.4	15.7	54.4	63
Zane		32.9	15.5	54.6	70
Crawford		35.0	14.9	55.2	81
NK 542-40		33.0	15.1	54.5	76
Pioneer 9441		30.6	15.3	54.3	77
Sparks		31.8	15.6	54.9	75
Bay		31.7	15.4	55.0	68
Essex		29.6	15.6	54.0	66
K77-50-53		31.7	15.4	54.4	78
Narow		31.3	15.1	54.4	73
Pershing		29.9	15.5	54.3	73
	LSD(.05)	NS	NS	NS	NS
	Burn	30.3	15.5	54.8	69
	Minimum	31.5	15.5	54.5	71
	No-tillage	32.5	15.0	54.5	76
	LSD(.05)	NS	NS	NS	NS
	Test mean	31.4	15.3	54.6	72
	C.V. (%)	14.1	4.6	2.3	18.0

Planted: November 3, 1985.

Fertilizer: 300 lb of 6-24-24/a plus 75 lb N/a as urea.



PHOSPHORUS, POTASSIUM, AND CHLORIDE EFFECTS ON DIFFERENT SOYBEAN CULTIVARS

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Summary

Results of 1980 and 1981 soil tests indicated that over half of the soils in southeastern Kansas were low to medium in P and K. In a study initiated in 1985 and continued in 1986 and 1987, we examined the effects of P, K, or Cl levels individually or the P-K interaction on several yield parameters and on the incidence of charcoal rot in different soybean cultivars. Potassium applications significantly increased yield and plant height. Phosphorus and Cl had no significant effect on yield or any yield parameter.

Introduction

Approximately 33 percent of Kansas' soybeans are grown in the southeastern part of the state. Soil test results from 1980 and 1981 indicated that over half of the soils in this area were low to medium in K, and 78 percent were low to medium in P. Charcoal rot is a major disease in southeastern Kansas and recently has been estimated to reduce yields by as much as 50 percent in some fields. In a study initiated in 1985 and continued in 1986 and 1987, we examined the effects of P, K, or Cl levels individually or the P-K interaction on several yield parameters and on the incidence of charcoal rot in different soybean cultivars.

Experimental Procedures

The experimental design was a split plot with a factorial arrangement of P, K, and Cl as whole plots and soybean cultivars as split plots with three replications. Rates of P were 0, 60, and 120 lb P₂O₅ per acre; K rates were 0, 75, and 150 lb K₂O per acre; and Cl rates were 0 and 118 lb Cl per acre. Phosphorus was applied as triple superphosphate; K was applied as muriate of potash (potassium sulfate was used in plots receiving K but not Cl); and Cl was applied as calcium chloride where K was not added. Six soybean cultivars from three maturity groups were used: Harper and Sprite (maturity group III), Desoto and Douglas (maturity group IV), and Bay and Essex (maturity group V).

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The experiment was conducted on a Parsons silt loam at the Parsons Field. Fertilizer was broadcast by hand and incorporated on 22 May 1985, 13 May 1986, and 15 May 1987, and soybeans were planted on 23 May 1985, 14 May 1986, and 15 May 1987. Six weeks after planting, 20 leaflets per treatment were sampled and analyzed for N, P, and K, and roots from four plants per treatment were sampled to determine the amount of charcoal rot in the plants, except in 1987, when root samples were taken only at the R6 growth stage. Sampling was continued during the growing season at 3-week intervals until seed harvest. Whole plant samples were taken at the R6 growth stage and analyzed for N, P, K, and Cl. Plant height, seeds per pound, and yield per acre were measured.

Results

The mean test yield was 39 bu/a in 1985, 19 bu/a in 1986 and 29 bu/a in 1987. Rainfall in August and September was higher than normal in 1985, whereas rainfall patterns in 1986 and 1987 were more typical for the area.

P and K Effects

Application of K_2O significantly affected yield, number of seeds per pound, and plant height (Table 1). In 1985 and 1987, 75 lb K_2O/a significantly increased soybean yield over the control. Although not significant, in 1986, 75 lb K_2O produced a higher yield than the check. Seed size was increased (i.e., number of seeds per pound was decreased) as K_2O was increased. The largest seeds in 1986 were produced with 150 lb K_2O/a . Plant height was unaffected by potassium application in 1985, but in 1986 and 1987, 75 lb K_2O significantly increased plant height. A significant potassium-by-cultivar interaction was found for yield in 1987 (Table 2). Sprite and Bay had significant yield increases with an application of 75 lb K_2O/a , whereas Douglas and Essex had yield increases with 150 lb K_2O/a . Harper and DeSoto did not show an increase with either application of potassium.

K and Cl Effects

The effects of K_2O , Cl, and cultivar on yield, plant height, and number of seeds per pound are shown in Table 3. Chloride did not significantly affect yield, plant height, or number of seeds per pound. K_2O increased yields significantly for all years tested and increased plant height in 1986 and 1987. Desoto and Harper were the highest yielding cultivars in 1985, whereas Bay was highest in 1986 and 1987.

Table 1. Potassium Effects on Yield, Number of Seeds per Pound, and Plant Height, 1985, 1986, and 1987.

K ₂ O Lb/a	Yield			Number of Seeds per Pound			Plant Height		
	1985	1986	1987	1985	1986	1987	1985	1986	1987
	-----Bu/a-----						-----In-----		
0	36.6	18.4	26.4	2705	3149	3116	26	22	28
75	40.1	19.4	29.7	2622	3148	3022	26	24	31
150	40.7	19.5	30.2	2596	3075	3021	26	24	31
LSD _(0.01)	2.7	ns	2.2	ns	ns	ns	ns	1	1
LSD _(0.05)	---	ns	---	34	ns	77	ns	--	--

Table 2. Soybean Yield as Influenced by Potassium and Cultivar Selection, 1987.

K ₂ O Lb/a	Soybean Cultivar					
	Harper	Sprite	Desoto	Douglas	Bay	Essex
	Yield, bu/a					
0	25.7	22.9	28.3	25.6	30.0	26.2
75	28.6	27.9	28.1	28.3	35.5	30.0
150	27.0	29.3	27.0	30.8	36.8	31.1
LSD _(0.01, any comparison)	4.8					

Table 3. Yield and Yield Components as Influenced by K, Cl, and Soybean Cultivars for 1985, 1986, and 1987

Soybean cultivar	K ₂ O	Cl	Yield			Plant Height			Number of Seed per Pound		
			1985	1986	1987	1985	1986	1987	1985	1986	1987
	Lb/a	Lb/a	-----Bu/a-----			-----In-----					
Harper	0	0	41.6	17.1	26.9	24	20	30	1995	2593	2696
	0	118	34.8	17.5	26.1	23	22	30	2260	2636	2758
	150	0	46.6	20.5	25.5	24	21	33	1861	2356	2749
	150	118	46.4	21.0	28.4	23	22	33	1947	2405	2871
Sprite	0	0	28.6	15.3	22.1	16	17	14	2341	3003	2979
	0	118	30.2	18.6	22.6	15	17	15	2539	3036	2854
	150	0	37.7	19.6	30.2	16	19	16	2046	3019	2919
	150	118	34.8	19.0	31.8	15	18	16	2072	2909	2765
Desoto	0	0	43.4	19.8	28.6	32	25	36	2400	3305	3204
	0	118	39.3	17.8	26.3	31	24	36	2616	3277	3192
	150	0	53.3	20.4	29.5	32	27	41	2215	3174	3322
	150	118	48.4	21.2	27.6	32	26	41	2283	3226	3308
Douglas	0	0	41.4	18.3	26.7	31	26	36	2370	2884	3097
	0	118	40.8	17.2	25.6	29	25	33	2482	3099	3196
	150	0	53.0	21.3	29.4	29	27	39	2100	2752	2940
	150	118	46.2	19.5	33.0	30	26	37	2417	2784	2594
Bay	0	0	36.6	20.0	28.5	34	27	29	3073	2946	3011
	0	118	34.2	19.5	31.2	34	26	30	3104	3210	2972
	150	0	41.4	21.4	38.1	34	31	34	3041	2992	3736
	150	118	38.0	22.0	41.2	35	30	35	2979	2986	3051
Essex	0	0	37.7	18.6	25.4	24	20	26	3957	4525	4299
	0	118	34.4	19.0	24.3	24	20	26	3845	4680	4416
	150	0	44.6	23.8	32.0	26	25	29	3659	4209	3892
	150	118	42.5	23.2	33.2	26	23	30	3884	4133	3550
LSD(.0.05)			ns	ns	ns	ns	ns	ns	ns	ns	ns
Main Effects											
		0	42.2	19.7	28.6	27	24	30	2588	3146	3237
		118	39.2	19.6	29.0	27	23	30	2702	3198	3128
LSD(.0.05)			ns	ns	ns	ns	ns	ns	ns	ns	ns
	0		36.9	18.2	26.2	26	22	28	2749	3266	3223
	150		44.4	21.1	31.4	27	25	32	2542	3079	3142
LSD(.0.01)			6.8	2.2	2.4	ns	1	2	ns	ns	ns
LSD(.0.05)			---	---	---	ns	-	-	ns	138	ns
Harper			42.3	19.0	26.8	23	21	32	2016	2497	2768
Sprite			32.8	18.1	26.7	16	18	15	2250	2992	2879
Desoto			46.1	19.8	28.0	32	25	38	2379	3246	3257
Douglas			45.4	19.1	28.7	32	26	36	2342	2880	2957
Bay			37.6	20.7	34.3	34	29	32	3049	3034	3193
Essex			39.8	21.1	28.7	25	22	28	3836	4387	4041
LSD(.0.01)			4.7	2.1	4.3	2	1	2	146	175	293



SULFUR EFFECTS ON DIFFERENT SOYBEAN CULTIVARS¹

G. V. Granade and D. W. Sweeney

Summary

Four soybean cultivars differed in yield and yield components. Sulfur did not affect any yield components, and there was no interaction between sulfur and soybean cultivar.

Introduction

Sulfur at four rates was applied to four soybean cultivars to determine if sulfur-containing fertilizers would increase yields. The experiment was conducted at the Parsons Field of the Southeast Kansas Branch Experiment Station and at an off-station site near Hallowell.

Experimental Procedures

The experimental design for both locations was a split plot with sulfur rates as whole plots and soybean cultivars as subplots. Sulfur rates were 0, 25, 50, and 75 lb S per acre, and soybean cultivars were DeSoto and Douglas from maturity group IV and Bay and Essex from maturity group V. Sulfur was applied as $(\text{NH}_4)_2\text{SO}_4$ and broadcast by hand before planting. Since N was applied with S (even though not recommended for soybeans), N was balanced with urea in all plots to equal the N rate that resulted from the 75 lb S per acre application.

The soil at the Parsons Field was a Parsons silt loam (Mollic Albaqualf). The Hallowell location was a Cherokee silt loam (Typic Albaqualf). Both sites were chiseled and disced before planting in early June. At the R6 growth stage, six plants from the border row were harvested for measuring leaf area, then leaves were dried for specific leaf weight. Plant height, seeds per pound, population, and yield per acre were the yield components that were measured.

Results

Sulfur did not significantly affect any of the yield components and there was no interaction between sulfur and cultivar for either location. The data suggest that S is not a yield limiting factor for soybean production on typical soils in southeastern Kansas.

¹Research partially funded by grants from The Sulfur Institute and The Allied Corporation.



SOUTHEAST KANSAS BRANCH STATION KANSAS STATE UNIVERSITY

PERFORMANCE OF EARLY MATURITY SOYBEANS IN SOUTHEASTERN KANSAS

George V. Granade

Summary

Thirty soybeans from maturity groups 00, 0, and I were planted in late April in two locations of Southeastern Kansas. Yields at one location averaged 27 bu per acre and at the second location averaged 24 bu per acre.

Introduction

Interest has increased in growing early soybeans and then following them with wheat in the fall. Maturity group 00, 0, and I soybeans are normally grown in the northern part of the United States; however, the possibility exists of growing these soybeans in southeastern Kansas. The growing season will be shorter and plant height will be reduced. The objective of this study was to examine yield potential of three groups of early soybeans.

Experimental Procedures

Thirty soybean cultivars from maturity groups 00, 0, and I were obtained and planted on 10 April at Mr. Calvin Flaharty's field, McCune and on 23 April at the Columbus Field of the Southeast Kansas Branch Experiment Station. Soybeans were drilled in 7-inch rows at the rate of 2 bushels per acre. Plant height, maturity, yield per acre, and number of seeds per pound were recorded.

Results

Yields at McCune ranged from 9 to 38 bu per acre, whereas the yields at Columbus ranged from 15 to 37 bu per acre (Tables 1 and 2). All varieties at both McCune and Columbus matured during July and were harvested in early August. Northrup King S15-50 and Weber 84 were the highest yielding varieties at McCune, while Asgrow A 1525, Pioneer 9202, and Jacques J-201 were the top varieties at Columbus. Varieties from maturity group I generally yield higher than varieties from maturity group 0 or 00.

Table 1. Yield and Yield Components of Maturity Groups 00, 0, and I Soybeans, McCune, 1987.

Brand	Variety	Yield Bu/A	Seed Quality	Number of Seed /Lb	Maturity		Stand Height %	Plant Height Inches	Pod Height Inches
					Mo	Day			
Northrup King	S15-50	38.0	4.0	3057	July	27	92	25	4.0
----	Weber 84	38.0	2.3	3771	July	27	90	25	3.0
Stine	0450	33.6	3.0	3535	July	19	83	22	2.6
Asgrov	A 1525	32.5	2.0	3279	July	22	75	19	2.3
Stine	1820	32.3	2.6	2853	July	25	87	22	2.0
AgriPro	AP 1776	29.6	2.0	2861	July	25	77	20	3.0
----	Sibley	29.4	2.3	3080	July	21	68	19	2.6
Pioneer	9202	29.3	2.3	2755	July	26	58	22	2.6
Jacques	J-150	28.5	2.6	3294	July	25	65	22	2.6
Northrup King	S06-57	27.3	2.3	3302	July	15	70	19	2.0
Jacques	J-201	27.3	3.3	3015	July	23	63	18	2.0
Pioneer	9181	27.1	3.0	2491	July	26	65	18	2.6
Jacques	J-S2	26.8	3.3	3303	July	17	77	20	2.3
Stine	1480	24.4	2.3	2872	July	24	67	18	3.0
Asgrov	A 1937	23.9	3.0	2939	July	26	72	21	2.6
Asgrov	A 0949	23.4	2.0	3639	July	9	63	16	2.6
----	Hodgson 78	22.8	2.3	3117	July	19	62	19	2.0
Herschman	Venus	21.9	2.3	2848	July	23	63	20	2.0
----	Evans	20.3	2.0	3394	July	9	53	17	2.3
----	Dawson	20.3	3.0	3362	July	8	55	15	2.0
Pioneer	9091	19.0	2.0	3469	July	12	60	13	2.0
----	McCall	18.3	2.3	3635	July	4	52	16	2.0
----	Dassel	16.4	2.3	3421	July	12	57	15	1.6
Pioneer	9061	16.3	2.0	4060	July	11	60	13	1.6
Asgrov	A 0358	15.0	2.0	4072	July	7	57	15	1.3
----	Chico	14.5	2.0	4015	June	30	57	13	2.3
Jacques	J-74	14.4	3.0	3580	July	8	53	16	2.6
----	Maple Ridge	13.6	2.0	3375	July	3	48	14	2.0
AgriPro	AP 120	10.9	2.3	3192	July	15	43	15	1.3
----	Ozzie	9.2	3.0	3241	July	7	35	14	1.6
	LSD _(0.05)	8.0	0.7	292		3	18	3	ns
	Test Mean	23.5	2.5	3294	--	--	64	18.0	2.3

Date Planted: April 10, 1987

Date Harvested: July 31, 1987

Herbicide: 1.6 pt Pro 5 (Trifluralin)/a and 2/3 pt Sceptor/a

Soil Test: pH 7.2, 32 lb P/a, 160 lb K/a

Table 2. Yield and Yield Components of Maturity Groups 00, 0, and I Soybeans, Columbus, 1987.

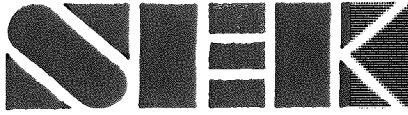
Brand	Variety	Seed		Number	Maturity		Plant	Pod	
		Yield	Quality		Mo	Day	Stand Height	Height	
		Bu/A	/Lb			%	Inches	Inches	
Agrow	A 1525	36.6	2.0	3620	July	27	90	21	2.3
Pioneer	9202	36.0	2.3	3092	Aug.	1	68	20	3.0
Jacques	J-201	36.0	2.3	3349	July	30	90	19	3.0
Merschman	Venus	34.1	3.0	2928	July	31	68	21	2.3
Jacques	J-150	33.8	2.3	3449	July	31	78	22	2.6
Pioneer	9181	33.0	3.3	3136	Aug.	1	72	17	2.3
Stine	0450	32.0	2.0	3927	July	27	63	21	3.0
Northrup King	S15-50	31.3	3.0	3680	July	29	83	24	3.0
----	Sibley	30.8	3.0	3449	July	29	65	20	2.3
Jacques	J-S2	30.6	2.0	3767	July	28	80	20	2.3
----	Hodgson 78	30.4	2.0	3360	July	28	70	19	2.6
AgriPro	AP 1776	30.3	2.0	3380	July	29	78	19	2.3
Stine	1480	30.1	3.0	3223	July	31	75	21	2.0
Agrow	A 1937	29.8	2.6	3455	July	30	83	22	2.6
Stine	1820	29.2	2.6	3427	July	30	85	19	2.0
----	Weber 84	29.0	2.3	4336	July	30	83	19	2.0
----	Dawson	28.9	3.0	3731	July	20	70	17	2.3
Northrup King	S06-57	28.5	2.3	3508	July	26	77	21	2.0
Pioneer	9061	25.6	2.0	4165	July	21	75	16	2.6
Agrow	A 0949	24.3	2.3	3746	July	22	75	16	2.0
Pioneer	9091	22.1	2.0	3918	July	22	77	15	2.3
----	Evans	21.8	2.6	3895	July	18	68	15	2.3
AgriPro	AP 120	21.4	2.0	3728	July	24	58	15	2.3
----	Chico	21.1	2.0	5249	July	12	78	13	3.3
Jacques	J-174	20.5	2.0	4130	July	18	62	15	2.0
Agrow	A 0358	20.2	2.3	4866	July	16	75	13	2.0
----	McCall	19.5	2.6	4384	July	10	72	16	3.3
----	Ozzie	18.9	2.3	3666	July	18	53	14	1.6
----	Maple Ridge	17.1	2.3	4060	July	14	57	17	3.3
----	Dassel	14.8	2.6	3878	July	28	45	14	2.0
	LSD(.05)	7.5	0.7	439		4	17	4	ns
	Test Mean	27.3	2.4	3750	--	--	73	18	2.5

Date Planted: April 23, 1987

Date Harvested: August 3, 1987

Herbicide: 1/3 lb Lexone DF/a and 1.5 pt Trefan/a

Soil Test: pH 7.1, 43 lb P/a, 180 lb K/a



EFFECT OF PLANTING DATE ON EARLY MATURITY SOYBEANS

George V. Granade

Summary

Soybeans from maturity groups 00, 0, and I were planted in early April, mid-April, and early May. Yield and yield components were measured. Soybeans from maturity group I planted in mid-April had the highest yields of 33-38 bu per acre.

Introduction

Interest in early soybeans has increased in southeastern Kansas. However, the best time to plant them has not been determined. The objective of this study was to examine the effect of planting dates on yield and yield components of soybean cultivars from three, early maturity groups.

Experimental Procedures

Three soybean cultivars each were obtained from maturity groups 00, 0, and I. Soybean cultivars were planted on April 9, April 24 and May 11 at the Parsons Field. They were planted at a rate of 2 bu per acre with a 12 row, 7-inch plot grain drill. Yield, maturity, plant height, pod height, seeds per pound, and seed quality were measured. In February, a sample of harvested seeds were sent to State Seed Laboratory for germination, hard seed, total germination, and accelerated aging.

Results

Yield and yield components are shown in Table 1 and germination and germination components are shown in Table 2. There were significant differences for yield, plant height, and maturity from the interaction of soybean cultivar and planting date. Hodgson 78, Sibley, Weber 84, Dawson, and McCall had their highest yields on the April 24 planting date, whereas the other cultivars peaked on the May 11 planting date. Plant height of the soybean cultivars followed the same pattern as yield.



EARLY SOYBEANS COMPARED WITH FULL SEASON SOYBEANS

George V. Granade

Summary

Soybeans cultivars from maturity groups 00, 0, I, III, IV, and V were planted in mid-April and early June at two locations in southeastern Kansas. Highest yields for maturity group 00, 0, and I soybeans were obtained from the April plantings, whereas yields for the group III, IV, and V soybeans were similar for the two planting dates.

Introduction

Interest in planting early soybeans (maturity groups 00, 0, and I) has increased, but questions have been asked about how they compare to full-season soybeans (maturity groups III, IV, and V). A study was initiated to examine how early soybeans yields and yield components compare to those of full-season soybeans.

Experimental Procedures

Soybean cultivars from maturity groups 00, 0, I, III, IV, and V were obtained and planted at the Columbus and Parsons Fields of the Southeast Kansas Experiment Station. Soybeans were drilled in 12 7-inch rows at the rate of 2 bushels per acre on April 23 and April 24 and planted in 30-inch rows at a rate of 139,000 seeds per acre on June 10 and June 4 at the Columbus and Parsons Fields, respectively. Yield, maturity, plant height, pod height, seed size, and seed quality were measured.

Results

Yield and yield components for the Columbus Field and Parson Field are shown in Tables 1 and 2, respectively. Yields for Columbus ranged from 12 to 33 bu per acre, whereas yields at Parsons ranged from 15 to 39 bu per acre. Hodgson 78, a group I soybean, planted in April had yields equal to or better than yields of Bay, a group V soybean, regardless of planting date. Yields of the early soybeans were reduced dramatically with the June planting, whereas yields of the full-season soybeans were about the same for either planting date. The full-season soybeans may have yielded well at both planting dates because of a cooler than typical August.

Table 1. Yield and Yield Components of Selected Group 00, 0, I, III, IV, and V Soybeans Planted in April and June, Columbus, 1987.

Variety	Date Planted ¹		1987 Yield	Seed Quality	Seed Size	Maturity	Plant Height	Pod Height
	Mo	Day	Bu/a	Score ²	Seed/lb	Mo Day	In	In
McCall	April	23	19.9	2.0	4550	July 21	16	2.2
Dawson	April	23	21.7	3.2	4250	July 22	19	2.5
Hodgson 78	April	23	29.9	2.8	4020	July 29	21	3.0
Zane	April	23	20.7	4.0	3730	Aug 14	24	4.2
Crawford	April	23	27.3	4.0	3070	Sept 28	40	6.8
Bay	April	23	33.4	2.2	2970	Oct 3	34	5.5
McCall	June	10	12.2	5.0	3910	Aug 20	16	2.5
Dawson	June	10	16.1	5.0	4110	Aug 26	18	2.0
Hodgson 78	June	10	12.9	4.5	3150	Sept 2	21	2.2
Zane	June	10	20.3	3.8	2710	Sept 25	20	3.2
Crawford	June	10	29.1	2.0	3170	Oct 1	26	4.8
Bay	June	10	27.5	2.0	3360	Oct 17	26	4.5
	LSD _(0.01)		5.0	0.5	336	1	ns	0.8
Main Effects								
McCall			16.1	3.5	4230	Aug 5	16	2.4
Dawson			18.9	4.1	4180	Aug 8	19	2.2
Hodgson 78			21.4	3.6	3580	Aug 15	21	2.6
Zane			20.5	3.9	3220	Sept 4	22	3.8
Crawford			28.2	3.0	3120	Sept 29	33	5.8
Bay			30.5	2.1	3160	Oct 10	30	5.0
	LSD _(0.01)		5.1	0.4	387	2	2	1.0
	April 23		25.5	3.0	3760	Aug 19	26	4.0
	June 10		19.7	3.7	3400	Sept 14	21	3.2
	LSD _(0.05)		3.3	0.5	ns	1	3	ns
Test mean			22.6	3.4	3580	----	24	3.6
C.V. (%)			16.3	9.0	7.9	0.7	5.3	20.3

¹ Soybeans planted in April were drilled in 7-inch rows at the rate of 2 bu/a; June planted soybeans were planted in 30-inch rows at the rate of 139,000 seeds/a.

² Score -- Rate on a scale of 1 to 5, 1 - very good; 2 - good; 3 - fair; 4 - poor; 5 - very poor.

Herbicide: 0.33 lb Lexone DF + 1.5 pt Treflan on April 23 as preplant incorporated.

Soil Test Results: pH 6.9; 38 lb P/a; 170 lb K/a.; sampled November, 1987.

Table 2. Yield and Yield Components of Selected Group 00, 0, I, III, IV, and V Soybeans Planted in April and June, Parsons, 1987.

Variety	Date		1987	Seed	Seed	Plant		Pod
	Planted ¹		Yield	Quality	Size	Maturity	Height	Height
	Mo	Day	Bu/a	Score ²	Seed/lb	Mo	Day	In
McCall	April	24	32.6	2.0	5260	July	21	20
Dawson	April	24	34.2	2.2	4950	July	27	20
Hodgson 78	April	24	39.2	2.5	3020	July	28	22
Zane	April	24	30.1	3.0	3330	Aug	13	27
Crawford	April	24	18.1	4.0	3550	Sept	25	38
Bay	April	24	30.4	3.2	2760	Oct	9	35
McCall	June	4	16.4	4.2	4900	Aug	14	24
Dawson	June	4	14.7	5.0	5570	Aug	15	23
Hodgson 78	June	4	16.1	4.0	3960	Aug	26	25
Zane	June	4	27.3	4.0	2740	Sept	18	25
Crawford	June	4	27.2	2.0	3200	Oct	1	32
Bay	June	4	32.4	2.5	2670	Oct	18	31
	LSD(0.01)		3.6	0.4	ns		3	2
	LSD(0.05)		--	--	309		--	--

Main Effects

McCall		24.5	3.1	5080	Aug	2	22	3.1
Dawson		24.5	3.6	5260	Aug	6	22	3.0
Hodgson 78		27.6	3.2	3490	Aug	11	24	3.4
Zane		28.7	3.5	3030	Aug	31	26	4.8
Crawford		22.7	3.0	3370	Sept	28	35	7.8
Bay		31.4	2.9	2720	Oct	13	33	5.8
	LSD(0.01)	5.0	ns	687		4	2	1.1
	LSD(0.05)	--	0.6	--		--	--	--
	April 24	30.8	2.8	3810	Aug	20	27	4.5
	June 4	22.3	3.6	3840	Sept	10	27	4.8
	LSD(0.05)	3.4	0.4	ns		2	ns	ns
Test mean		26.6	3.2	3826	----		27	4.6
C. V. (%)		13.7	14.4	13.1		1.3	6.3	17.1

¹Soybeans planted in April were drilled in 7-inch rows at the rate of 2 bu/a; June planted soybeans were planted in 30-inch rows at the rate of 139,000 seeds/a.

²Score -- Rate on a scale of 1 to 5, 1 - very good; 2 - good; 3 - fair; 4 - poor; 5 - very poor.

Herbicide: 0.33 lb Lexone DF + 1.5 pt Treflan on April 9 as preplant incorporated.

Soil Test Results: pH 5.5; 51 lb P/a; 200 lb K/a.; sampled November, 1987.



COMPARISON OF CLEANED BIN-RUN WHEAT SEED AND CERTIFIED WHEAT SEED

George V. Granade

Summary

Three hard red winter wheat varieties, one hybrid hard red winter wheat, and two soft red winter wheat varieties were planted in fall, 1985 and harvested in June, 1986. Wheat seed was blown and saved until fall, 1986. In the fall, certified seed and cleaned bin-run seed were planted. In June, 1987, wheat yields were measured. Generally, cleaned bin-run seed yields were higher than those of certified seed, but were similar for the hybrid hard red winter wheat. Certified seed of one soft red winter wheat gave higher yields than the clean bin-run seed.

Introduction

Seed saved from year to year usually yields lower than certified seed, especially seeds of hybrids. Corn seed that has been saved from the previous season yields lower and produces a lot of variation in plant height. It would seem that wheat hybrids would follow a similar pattern. A study was initiated to examine the effect of saving seeds from wheat varieties or hybrids compared to using certified seed of the same wheat varieties or hybrids.

Experimental Procedures

Three hard red winter wheat varieties (Arkan, Chisholm, and TAM 107), one hard red winter hybrid wheat (Bounty 205), and two soft red winter wheat (Caldwell and McNair 1003) were planted in the fall, 1985 in a 10 by 50 foot block and harvested in June 1986. Wheat seed was blown once and stored for fall planting. Certified seed of the same wheat varieties was obtained in the fall, 1986. On October 21, both clean bin-run seed and certified seed was planted with a 5-foot plot grain drill (7-inch row spacing) at a rate of 1,080,000 seeds per acre. Wheat was harvested on June 15, 1987. Plant stand and incidence of disease were estimated in early spring. At harvest, yield, test weight, protein content, kernels per head, thousand kernel weight, and heads per acre were determined.

Results

Plant stand, disease rating, yield, and yield components are shown in Table 1. Significant differences were found for yield from seed source, variety, and the interaction of seed source X variety. Cleaned bin-run wheat seed yields generally were higher than those of the certified wheat seed. Caldwell was the highest yielding wheat variety and Arkan was the lowest. Yields from the cleaned bin-run seed were significantly higher than yields from the certified seed for McNair 1003. Higher yields were obtained with certified seed for Caldwell.



Table 1. Yield and Yield Components of Wheat Varieties from Bin-run and Certified Seed Sources, Parsons, 1987.

Variety	Seed Source	Plant Stand ¹ %	Disease Rating ²	50 Percent Heading Month Day	Yield Bu/a	Test Weight Lb/bu	Protein Content %	Kernels per Head	TKW ³ gram	Heads per Acre
Arkan	Certified	85	2.0	April 30	50.1	54.9	14.6	25.7	21.7	2,002,900
	Bin-run ⁴	85	2.5	April 30	53.7	55.3	14.4	26.1	22.3	2,695,700
Bounty 205	Certified	67	1.3	May 3	54.4	55.7	14.0	32.6	24.4	2,412,000
	Bin-run	68	1.5	May 3	53.0	56.3	14.2	25.7	23.9	1,973,100
Chisholm	Certified	73	3.8	April 28	61.0	57.1	12.0	27.2	30.1	2,027,000
	Bin-run	92	3.8	April 28	64.6	56.1	12.2	27.0	27.6	2,291,700
TAM 107	Certified	87	4.3	April 28	52.5	52.0	13.2	28.0	21.9	2,402,000
	Bin-run	90	3.8	April 28	57.2	52.5	12.9	23.6	24.8	2,452,600
Caldwell	Certified	83	2.0	April 29	67.6	53.4	12.0	34.2	21.2	2,100,000
	Bin-run	67	1.8	April 29	60.0	53.5	12.2	36.8	22.3	2,688,300
McNair 1003	Certified	68	2.2	May 1	45.2	47.1	13.4	29.9	25.1	1,866,900
	Bin-run	90	1.7	May 1	62.2	47.5	12.6	29.7	28.2	2,230,300
	LSD _{0.05}	ns	ns	ns	8.1	ns	ns	ns	ns	ns
<u>Main Effects</u>										
Arkan		85	2.2	April 30	51.9	55.1	14.5	25.9	22.0	2,349,300
Bounty 205		78	1.4	May 3	53.7	56.0	14.1	29.1	24.2	2,191,500
Chisholm		83	3.8	April 28	62.8	56.6	12.1	27.1	28.8	2,159,300
TAM 107		88	4.1	April 28	54.8	52.3	13.0	25.8	23.4	2,427,300
Caldwell		75	1.9	April 29	63.8	53.4	12.1	35.5	21.8	2,394,100
McNair 1003		79	1.9	May 1	53.7	47.3	13.0	29.8	26.6	2,048,600
	LSD _{0.05}	ns	0.5	1	5.7	1.7	0.9	4.1	2.1	ns
	Certified	78	2.6	April 30	55.1	53.4	13.2	29.6	24.1	2,135,100
	Bin-run	85	2.5	April 30	58.4	53.5	13.1	28.1	24.8	2,388,600
	LSD _{0.05}	ns	ns	ns	3.3	ns	ns	ns	ns	ns

¹ Visual estimation made on April 8, 1987.

² Rating for disease on a scale of 1 to 5, with 1 being no disease on the flag leaf and 5 flag leaf completely infected with disease; disease was barley yellow dwarf.

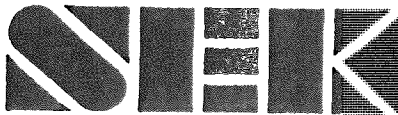
³ TKW -- Thousand kernel weight.

⁴ Bin-run seed was blown one time.

Planted: October 21, 1986.

Fertilizer: 250 lb 6-24-24/acre and 60 lb N/acre as urea on September 25, 1986.

Harvested: June 15, 1987.



EFFECT OF CROPPING SEQUENCE ON CHARCOAL ROT IN CORN AND SOYBEAN

C. A. S. Pearson¹, G. V. Granade, and F. W. Schwenk¹

Summary

Disease severity and soil populations of the charcoal rot fungus were monitored for a 3-yr-cropping sequence of corn and soybeans. In a field where soil-borne inoculum preferred soybeans as a host, cropping sequences involving corn reduced soil levels of the fungus. The amount of fungus recovered from the soil in September was related to the crop planted during the previous year rather than the current crop or 2- or 3-yr-cropping sequences.

Corn tissue contained less fungus than soybean tissue during 1987. Although soil-borne fungus preferred soybeans, isolates with a preference for corn were recovered from corn tissue. Corn-type isolates of the charcoal rot fungus were recovered from seed used to plant the 1987 crop.

Introduction

Charcoal rot is a late-season, fungal disease that affects a variety of crops grown under conditions of stress. Until recently, all isolates of the charcoal rot fungus were considered to be one group equally able to attack any host. Comparative studies with many isolates of this fungus, however, indicate that the pathogen can be partitioned into three groups: one attacks corn, one attacks soybean, and one primarily attacks soybean but may also infect corn under certain conditions. These isolates can be identified when the fungus is grown on a test medium containing potassium chlorate. Soybean isolates are inhibited in their growth on this medium, whereas corn isolates are not. The inability of soybean isolates to attack corn, and vice versa, suggests that crop rotation might serve as a possible disease management practice. A study was initiated in 1985 to determine the impact of corn and soybean cropping sequences on soil and tissue populations of the charcoal rot fungus.

Experimental Procedures

During 1985, the soybean cultivar Douglas and the corn cultivar Garst Blend 120 were planted in a randomized complete block design in eight row plots. Soil samples were collected prior to planting and assayed for the charcoal rot fungus; no corn types of the fungus were observed. During 1986, corn (C) and soybeans (S) were planted into the same area to give four cropping

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sequences: C-C, C-S, S-C, and S-S. In the third season, the 1986 plots were divided in half and planted with the soybean cultivar Douglas and the corn cultivar Garst 8315 (a split-plot design), thus resulting in 8 cropping sequences: C-C-C, C-C-S, C-S-S, C-S-C, S-C-C, S-S-C, S-C-S, and S-S-S. In September of each year, soil and plant samples were collected and assayed for frequency of the three fungal types.

Results

The level of charcoal rot fungus recovered from the soil in 1987 was influenced primarily by the preceding (1986) crop; the 1987 and 1985 crops did not significantly alter soil levels of the fungus for 1987 (Tables 1, 2). The corn type of the fungus was not recovered from the soil during 1985, 1986, or 1987. In this experiment where soil-borne inoculum was composed of isolates that preferred soybeans as a host, less fungus was recovered from areas cropped to corn (Table 2). Poor colonization of corn by soybean-type isolates may have limited inoculum production and reduced fungus soil populations. Soil levels of fungus were highest after a 2 yr (1985/1986) S-S sequence and lowest after a C-C sequence. Although cropping history did not significantly alter the relative frequencies of the two soybean types of charcoal rot fungus recovered from soil, 3 yr sequences of C-C-C and S-C-C tended to have lower levels of the intermediate type and slightly elevated levels of the soybean type fungus. This tendency may be a function of inoculum survival in which a small portion of both fungal types may survive for long periods. Death of even a few propagules under such conditions might be perceived as a large shift in charcoal rot fungus types.

The level of the fungus recovered from root tissue was influenced by the current (1987) crop, with significantly less fungus from corn than from soybeans (Tables 1, 3). It should be noted, however, that the level of fungus isolated from corn was approximately 10 times higher in 1987 than in 1986 (data not shown). Although none of the isolates obtained from corn tissue in 1986 were of the corn type, nearly 60% of the strains recovered in 1987 were of this type (Table 3). The dramatic increase in the corn group of the fungus was not related to cropping history and was not associated with a change in the soil populations of the fungus.

The charcoal rot fungus may be introduced in or on seed. The seed-borne nature of the fungus has been commonly observed in peanut, okra, lima bean, jute, and soybean. Corn seed used to plant the 1987 crop of our study was evaluated for the presence of the charcoal rot fungus. The corn type of the fungus was recovered from 0.25% of the seed. This cropping sequence study will be continued in 1988.

Table 1. Analysis of Variance for the Amount and Type of Charcoal Rot Fungus Recovered from Soil and Soybean or Corn Root Tissue with Respect to Cropping History and Current Crop^a.

Source of Variation	Mean Squares							
	Soil				Tissue			
	Level ^c	Fungal Types ^b			Level ^c	Fungal Types		
	CN	I	SB		CN	I	SB	
Replication	379.7	--	0.08	0.08	1.32	0.07	0.61 ^d	0.61 ^d
1985 crop	195.0	--	0.02	0.02	0.06	0.01	0.22	0.22
1986 crop	3220.0 ^e	--	0.28	0.29	0.60	0.03	0.01	0.01
1985 x 1986	11.3	--	0.01	0.01	0.06	0.36	0.14	0.05
Whole-plot error	145.5	--	0.11	0.11	0.56	0.28	0.33	0.36
1987 crop	0.8	--	0.02	0.02	3.06 ^e	5.13 ^e	0.06	6.32 ^e
1985 x 1987	185.3	--	0.07	0.06	0.50	0.18	0.01	0.33
1986 x 1987	63.3	--	0.16	0.17	1.02	0.05	0.01	0.05
1985 x 1986 x 1987	5.3	--	0.01	0.01	0.02	0.16	0.01	0.20
Subplot error	88.4	--	0.04	0.04	0.50	0.20	0.07	0.10

^aCropping history=1985/1986 cropping sequences of corn and soybean; current crop=1987 crop of corn or soybean.

^bPhenotypes of *Macrophomina phaseolina* evaluated on a test medium containing potassium chlorate; CN=corn phenotype (chlorate resistant), I=intermediate (moderately chlorate sensitive and can be isolated from both corn and soybean), and SB=soybean phenotype (chlorate sensitive).

^cNumber of colony forming units (CFU) per gram of soil.

^dLog₁₀ (Colony forming units/g dry root + 1).

^esignificant difference (P=0.05).

Table 2. Influence of 1985, 1986, and 1987 Crop History on the Amount of Charcoal Rot Fungus Recovered from Soil in 1987.

Three Year Cropping Sequence (1985/1986/1987)	1987 Fungus Level (Colonies/ g soil)	Fungus Types (%) ^a		
		CN	I	SB
Soybean/soybean/corn	39.5	0.0	94.4	5.6
Soybean/soybean/soybean	37.0	0.0	85.2	14.8
Corn/soybean/soybean	36.5	0.0	89.6	10.4
Corn/soybean/corn	27.8	0.0	90.5	9.5
Soybean/corn/corn	20.3	0.0	76.6	23.4
Corn/corn/soybean	14.0	0.0	80.5	19.5
Soybean/corn/soybean	13.8	0.0	83.8	16.2
Corn/corn/corn	12.5	0.0	63.8	36.2
LSD(0.05)	17.1	---	ns ^b	ns
<u>1987 Crop</u>				
Soybean	25.3	0.0	84.8	15.2
Corn	25.0	0.0	81.1	18.8
LSD(0.05)	ns	---	ns	ns
<u>1986 Crop (previous crop)</u>				
Soybean	35.2	0.0	89.9	10.1
Corn	15.1	0.0	76.2	23.8
LSD(0.05)	9.6	---	ns	ns
<u>1985 Crop (previous crop)</u>				
Soybean	27.6	0.0	85.0	15.0
Corn	22.7	0.0	81.0	19.0
LSD(0.05)	ns	---	ns	ns

^aPhenotypes of Macrophomina phaseolina evaluated on a test medium containing potassium chlorate; CN=corn phenotype (chlorate resistant), I=intermediate (moderately chlorate sensitive and can be isolated from both corn and soybean), and SB=soybean phenotype (chlorate sensitive).

^bns=not significantly different (P=0.05).

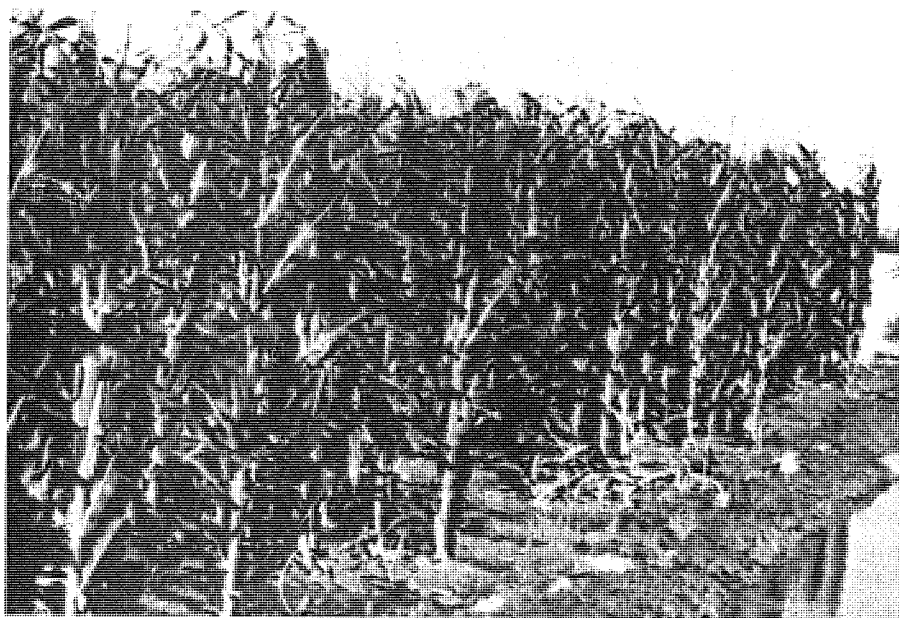
Table 3. Influence of Current Crop on the Amount and Type of Charcoal Rot Fungus Plant Tissue.

1987 Crop	Level ^a	CN	I	SB
Soybean	2.87	4.9	27.5	67.6
Corn	2.25	57.5	32.8	9.7
LSD _(0.05)	0.51	sd**	ns	sd

^aPhenotypes of Macrophomina phaseolina evaluated on a test medium containing potassium chlorate; CN=corn phenotype (chlorate resistant), I=intermediate (moderately chlorate sensitive and can be isolated from both corn and soybean), and SB=soybean phenotype (chlorate sensitive).

^bLog10 (colony forming units/g dry root + 1).

**sd=significantly different (P=0.05); percentage data were analyzed using an arcsin transformation; ns=not significantly different (P=0.05).



**EFFECTS OF INTENSIVE MANAGEMENT PRACTICES
FOR SELECTED WINTER WHEAT VARIETIES**

Kenneth Kelley

Summary

Effects of two intensive cereal management practices were compared with selected winter wheat varieties in southeastern Kansas. In 1987, applying nitrogen both in fall and late-winter was no better than applying N in the fall only, but a systemic fungicide significantly increased yield and grain quality of varieties that were susceptible to foliar leaf diseases.

Introduction

The objective of intensive cereal management (ICM) is to produce winter wheat as efficiently as possible. Although the practice has been popular in the European wheat producing countries, it has not been researched fully in the more humid wheat producing regions of the Great Plains.

Experimental Procedure

The experimental design was a split-plot arrangement, which included four management practices as main plots: 1) fall N, 2) fall N + systemic fungicide, 3) fall + late-winter N, and 4) fall + late-winter N + systemic fungicide. Ten winter wheat varieties represented the subplots. The N source was urea, and rates of N application were 55 and 110 lb/A. Tilt, a systemic foliar fungicide, was applied in late April at 4 oz/A.

Results

Although wheat planting was delayed until late November because of wet soil conditions during October in southeastern Kansas, wheat emergence was good, and the milder than normal winter promoted good spring growth. Fall applied nitrogen produced significantly higher yields than a fall + late winter application (Table 1).

The systemic fungicide treatment significantly increased both grain yield and quality (Table 2). The range of yield increase from Tilt was 0.6 to 18 bu/A for the 10 varieties. Leaf rust and septoria were the main diseases present during the critical reproductive stage of development in May (Table 3). Chisholm and Tam 107, which are susceptible to foliar leaf diseases, showed the highest yield response to the fungicide, but they also produced the most without Tilt. Evidently, their early maturity was a factor in the interaction of yield and fungicide response.

Table 1. Effects of Intensive Management Practices on Yield and Test Weight of Winter Wheat, SEK Branch Station, 1987.

Brand Variety	Grain Yield				Test Weight			
	Fall - N		Fall + LW - N		Fall - N		Fall + LW - N	
	Fungicide				Fungicide			
	No	Yes	No	Yes	No	Yes	No	Yes
	----- bu/A -----				----- lb/Bu -----			
Agripro Victory	34.7	44.4	31.1	44.9	53.7	55.7	53.1	54.9
Arkan	37.1	36.9	32.0	33.8	55.5	55.9	54.8	54.8
Bounty 122	35.0	45.8	30.6	43.8	54.1	55.5	51.6	54.5
Chisholm	50.7	63.0	45.8	61.9	56.6	59.5	55.7	58.1
Garet HR-48	36.3	39.4	29.9	38.8	53.9	55.6	52.3	55.0
Pioneer 2157	38.8	45.9	33.3	45.1	57.6	59.1	57.1	58.2
Siouxland	38.6	39.2	33.0	34.2	55.9	56.1	55.4	56.2
Tam 107	46.5	57.0	41.4	59.3	54.5	57.6	53.0	57.1
Caldwell	46.5	53.3	46.5	48.9	54.5	56.4	53.9	54.9
McNair 1003	26.8	31.5	24.9	31.8	49.5	50.8	48.7	50.0
(Means)	39.1	45.6	34.9	44.3	54.6	56.2	53.6	55.4
<u>LSD .05</u>					(Grain Yield) (Test Weight)			
Any comparison among management practices and varieties:					4.4 bu/A	1.1 lb/Bu		
Comparing varieties within the same management factor:					4.4 bu/A	1.0 lb/Bu		
C.V.					6.6%	1.2%		

Fall N rate: 55 lb N/A; Fall + LW (late-winter) N rate: 110 lb N/A
 N application dates: fall (Oct. 20, 1986); late-winter (March 6, 1987)
 Fungicide: Tilt, 4 fl. oz/A on May 1, 1987
 Planting date: November 25, 1986

Table 2. Effects of Intensive Management Practices on Grain Protein and Kernel Weight of Winter Wheat, SEK Branch Station, 1987.

Brand	Variety	Grain Protein					Thousand Kernel Weight					
		Fall-N		Fall + LW-N		(Avg)	Fall-N		Fall + LW-N		(Avg)	
		Fungicide					Fungicide					
No	Yes	No	Yes	(Avg)	No	Yes	No	Yes	(Avg)			
		----- % -----					----- gr -----					
Agripro	Victory	14.6	14.5	15.0	14.6	14.7	23.3	26.4	21.8	24.9	24.1	
Arkan		15.2	15.1	16.1	15.0	15.3	24.1	24.5	22.2	24.1	23.7	
Bounty	122	14.1	15.3	14.1	14.7	14.6	26.9	32.2	26.5	30.0	28.9	
Chisholm		12.6	12.9	13.5	13.4	13.1	26.4	32.7	25.2	30.7	28.8	
Garst	HR-48	15.1	16.0	14.6	15.7	15.4	25.6	28.2	22.3	27.4	25.9	
Pioneer	2157	13.1	14.9	14.8	14.8	14.4	23.8	26.8	22.4	26.9	25.0	
Siouxland		13.9	13.7	15.0	14.5	14.3	25.5	27.4	24.2	26.7	26.0	
Tam	107	13.3	13.0	13.9	14.1	13.6	26.1	30.9	24.6	30.3	28.0	
Caldwell		13.0	12.3	13.3	12.7	12.8	21.2	23.1	20.6	21.7	21.6	
McNair	1003	14.2	14.8	14.6	15.6	14.8	23.1	26.1	22.3	25.4	24.2	
(Means)		13.9	14.3	14.5	14.5	----	24.6	27.8	23.2	26.8	----	
<u>F-test significance:</u>												
Management treatment:						n. s.						*
Variety:						*						*
Management x variety interaction:						n. s.						*
<u>LSD 0.05:</u>												
Comparing variety means averaged over management treatments:						0.5						
Any comparison:						---						1.5
Varieties within same level of mngt:						---						1.3
C. V.						4.4%						3.2%

Fall N rate: 55 lb N/A; Fall + LW (late-winter) N rate: 110 lb N/A
 Fungicide: Tilt, 4 fl. oz./A on May 1, 1987

Table 3. Effects of Intensive Management Practices on Leaf Disease Rating and Plant Maturity, SEK Branch Station, 1987.

Brand Variety	Leaf Rust Rating				Leaf Septoria Rating				Date Headed
	Fall - N		Fall + LW-N		Fall - N		Fall + LW-N		
	Fungicide				Fungicide				
	No	Yes	No	Yes	No	Yes	No	Yes	
Agripro Victory	1.1	1.0	1.2	1.0	2.1	1.1	1.5	1.1	May 9
Arkan	1.1	1.0	1.1	1.0	1.8	1.2	2.1	1.2	May 6
Bounty 122	1.5	1.0	1.7	1.0	2.2	1.3	2.1	1.3	May 6
Chisholm	3.2	1.1	3.2	1.0	4.0	1.3	4.0	1.3	May 4
Garst HR-48	2.0	1.0	2.2	1.0	3.0	1.3	2.9	1.4	May 6
Pioneer 2157	2.1	1.1	2.7	1.0	3.1	1.2	3.3	1.4	May 6
Siouxland	1.0	1.0	1.0	1.0	1.9	1.2	1.9	1.2	May 6
Tam 107	2.9	1.1	3.0	1.0	3.8	1.3	4.0	1.3	May 4
Caldwell	1.0	1.0	1.1	1.0	2.0	1.1	2.0	1.1	May 6
McNair 1003	1.1	1.0	1.8	1.0	2.0	1.2	1.9	1.3	May 10
(Means)	1.7	1.0	1.9	1.0	2.6	1.2	2.6	1.3	
<u>LSD .05</u>					(Leaf Rust)		(Leaf Septoria)		
Any comparison among management practices and varieties:					0.4		0.4		
Comparing varieties within the same management practice:					0.4		0.3		
C. V.					15.7%		9.9%		

Fall N rate: 55 lb N/A; Fall + LW (late-winter) N rate: 110 lb N/A

Fungicide: Tilt, 4 fl. oz./A on May 1, 1987

Leaf disease rating scale: 1 = no diseases on flag leaf; 5 = flag leaf completely covered with leaf diseases.

Planting date: November 25, 1986



EFFECTS OF PREVIOUS CROP ROTATION AND TIME OF NITROGEN APPLICATION ON WHEAT YIELD

Kenneth Kelley

Summary

In 1987, the previous crop rotation (oats, soybeans, or grain sorghum) did not have a significant effect on wheat yield, test weight, or grain protein. Nitrogen applied in the fall prior to planting produced slightly higher yields than N applied both in fall and late-winter or late-winter only.

Introduction

This research was initiated to evaluate the effects of nitrogen fertilization when wheat follows three different crops - small grains, soybeans, or grain sorghum. In southeastern Kansas, wheat is typically grown after these three crops. To further evaluate nitrogen fertilizer response, time and rate of N applications were also included.

Experimental Procedure

The experimental design was a split-plot, with the previous crop rotation (oats, grain sorghum, or soybeans) as main plots and subplots consisted of four nitrogen rates (0, 40, 80, and 120 lb/A) and three application dates (preplant N in the fall, topdressed N in late-winter, and split N treatments). Urea was the N source for the fall and late-winter applications, whereas liquid 28% N was the source for the early spring foliar treatment.

Results

Although the fall of 1986 was extremely wet in southeastern Kansas, wheat emergence and fall growth were excellent. The milder than normal winter conditions also promoted good early spring wheat development.

The previous crop rotation did not have a significant effect on wheat yield, test weight, grain protein or yield components in 1987 (Tables 1, 2, and 3). However, nitrogen treatments did significantly affect grain yield, although the N response was somewhat low for the initial year of this crop rotation study. Despite the extremely wet soil conditions in the fall, nitrogen that had been applied in the fall as a preplant treatment was still superior to late-winter or split applications in both fall and late-winter. The plot site had good surface drainage, so water did not stand on the soil surface, which might have promoted the loss of fall-applied N under denitrification conditions.

Table 1. Effects of Previous Crop Rotation and Time and Rate of Nitrogen Application on Grain Yield and Test Weight of Wheat.

Time and Rate of N			Grain Yield				Test Weight		
F	LW	SPR	Previous Crop			Avg.	Previous Crop		
			Oats	Soy	Milo		Oats	Soy	Milo
--- lb N/A ---			----- bu/A -----				----- lb/Bu -----		
0	0	0	53.6	53.2	54.2	53.7	57.2	57.2	58.0
40	0	0	54.6	56.8	58.3	56.5	57.9	57.6	57.9
80	0	0	58.1	61.0	59.8	59.6	56.9	57.7	58.0
120	0	0	56.2	58.1	60.9	58.4	57.8	57.7	57.8
20	20	0	53.4	55.9	54.9	54.7	57.3	57.7	58.0
40	40	0	56.1	57.6	58.8	57.5	57.3	57.2	57.7
60	60	0	55.5	59.7	58.5	57.9	57.0	58.2	57.1
10	20	10	48.9	55.4	53.8	52.7	57.5	57.6	58.2
20	40	20	55.5	56.9	59.8	57.4	57.0	57.7	57.1
30	60	30	56.6	56.3	58.6	56.3	57.7	57.7	57.5
0	40	0	51.7	51.1	54.8	52.5	57.2	57.2	57.3
0	80	0	53.9	54.2	56.4	54.8	56.7	58.2	57.7
<u>(Means)</u>			54.5	56.4	57.4	-----	57.3	57.6	57.7
<u>F-test significance:</u>									
Crop rotation:						n. s.	n. s.		
Nitrogen treatments:						*	n. s.		
Crop rot. x N trt. interaction:						n. s.	n. s.		
<u>LSD 0.05:</u>									
Comparing N treatment means									
averaged over crop rotation: =						2.9 bu/A			
Comparing N treatments within									
same crop rotation: =						5.1 bu/A			
C.V.						6.5 %	1.4%		

Time of N: F = fall (Oct. 20, 1986), LW = late-winter (Mar. 6, 1987), and SPR = early spring (April 21).

N source: Urea (fall and late-winter) and 28% N (early spring).

Variety: Chisholm, planted Oct. 21, 1986.

Table 2. Effects of Previous Crop Rotation and Time and Rate of Nitrogen Application on Whole Plant Nitrogen and Grain Protein.

Time and Rate of N			Whole Plant Nitrogen				Grain Protein			
F	LW	SPR	Previous Crop				Previous Crop			
			Oats	Soy	Milo	Avg.	Oats	Soy	Milo	Avg.
---	lb N/A	---	----- % -----				----- % -----			
0	0	0	1.53	1.49	1.44	1.49	11.1	11.1	10.9	11.0
40	0	0	1.59	1.48	1.53	1.53	11.0	10.7	10.6	10.8
80	0	0	1.77	1.54	1.36	1.55	11.5	10.8	10.5	10.9
120	0	0	1.68	1.59	1.47	1.58	11.2	11.1	11.1	11.1
20	20	0	1.67	1.52	1.55	1.58	11.2	10.9	10.7	10.9
40	40	0	1.83	1.60	1.55	1.66	11.7	11.2	11.2	11.4
60	60	0	1.70	1.57	1.57	1.61	11.2	11.2	11.3	11.3
10	20	10	1.81	1.68	1.56	1.68	11.5	11.1	11.3	11.3
20	40	20	1.70	1.67	1.74	1.70	11.5	11.5	11.5	11.5
30	60	30	1.85	1.66	1.69	1.73	11.4	11.7	11.6	11.6
0	40	0	1.69	1.58	1.55	1.60	11.4	11.0	11.4	11.3
0	80	0	1.95	1.67	1.60	1.74	11.3	11.0	11.3	11.2
<u>(Means)</u>			1.73	1.59	1.55	----	11.3	11.1	11.1	----
<u>F test significance (.05):</u>										
Crop rotation:						*	n. s.			
Time and rate of Nitrogen:						*	*			
Crop rotation x Nitrogen:						*	n. s.			
<u>LSD .05:</u>										
Any comparison:						0.18%	0.82%			
Comparing N treatments within crop rotation:						0.15%	0.59%			
Comparing N treatments averaged over crop rotation:						----	0.34%			
C.V.						6.50%	3.70%			

Whole plant nitrogen samples were taken at the flowering stage.

Table 3. Effects of Previous Crop Rotation and Time of Nitrogen Application on Yield Components of Winter Wheat.

Time & Rate of Nitrogen			Spike Density				Kernel Number				Kernel Size				
			Previous Crop				Previous Crop				Previous Crop				
F	LW	SPR	Oat	Soy	Milo	Avg	Oat	Soy	Milo	Avg	Oat	Soy	Milo	Avg	
lb	N/A		-- Spikes/meter --				-- Kernels/spike --				-- Gr./1000 seeds --				
0	0	0	111	116	108	111	35.2	32.9	33.6	33.9	32.0	30.9	33.4	32.1	
40	0	0	125	134	114	124	34.5	33.1	33.4	33.7	32.6	34.2	33.2	33.4	
80	0	0	137	132	128	132	35.6	34.6	34.3	34.8	32.3	32.7	33.5	32.8	
120	0	0	148	138	158	148	34.2	31.9	33.2	33.1	30.6	32.7	31.5	31.6	
20	20	0	114	125	118	119	36.2	33.1	33.1	34.1	32.4	33.4	32.7	32.8	
40	40	0	127	141	119	129	37.8	30.3	34.2	34.1	31.2	33.0	31.3	31.8	
60	60	0	156	161	147	154	36.8	33.4	32.6	34.2	30.0	32.3	31.7	31.4	
10	20	10	116	118	121	118	37.4	35.3	33.0	35.2	32.1	33.0	33.0	32.7	
20	40	20	127	118	131	125	35.2	35.6	35.5	35.4	31.3	31.9	30.9	31.4	
30	60	30	136	132	140	136	39.0	33.5	33.9	35.5	30.0	31.4	30.8	30.7	
0	40	0	112	103	100	105	37.0	33.1	33.7	34.6	31.2	32.7	31.6	31.8	
0	80	0	118	108	108	111	37.2	34.9	36.2	36.1	30.1	32.5	30.6	31.1	
<u>(Means)</u>			127	127	124	---	36.3	33.5	33.9	----	31.3	32.5	32.0	----	
<u>F-test significance:</u>															
Crop rotation:						*					*	n.s.			
Nitrogen:						*					n.s.	*			
Crop rot. x N interaction						*					n.s.	n.s.			
<u>LSD 0.05:</u>															
Crop rotation means:						--					1.8	----			
Nitrogen means:						--					---	0.9			
Any comparison						8					3.8	2.1			
Comparing within crop rot.						8					3.5	1.6			
C.V., %						9					7.2	3.5			



EFFECTS OF PLANTING DATE AND FOLIAR FUNGICIDE
ON WINTER WHEAT PRODUCTION

Kenneth Kelley

Summary

Selected winter wheat varieties were planted in October and November to evaluate the effectiveness of a systemic foliar fungicide as a management practice to reduce yield losses associated with leaf diseases during the critical reproductive stage of grain development. In 1987, wheat yields from the November planting ranged from 2 to 24 bu/A less than for the October planting. Yields ranged up to 8 bu/A higher from the foliar fungicide application, with the largest benefit to varieties that had less leaf disease resistance.

Introduction

Wheat is planted over a wide range of planting dates in southeastern Kansas because of the varied cropping rotations of the area. However, yields are often significantly lower as a result of the delayed planting. More research is needed to evaluate the effects of planting date on yield and also on the occurrence of foliar leaf diseases.

Experimental Procedure

Twelve winter wheat cultivars were evaluated at two different planting dates (Oct. 21 and Nov. 24). Subplots consisted of either a systemic fungicide application (Tilt) or no treatment. Tilt was applied at 4 oz/A after the flag leaf had fully emerged. Wheat seeding rate was approximately 1,000,000 seeds/acre for the October planting and 1,250,000 seeds/acre for the November planting.

Results

All wheat cultivars yielded significantly higher when planted in October (Table 1). The response to the systemic fungicide treatment was nearly the same for the October and November plantings, although variety response varied according to disease resistance and plant maturity (Tables 2 and 3). In general, cultivars with low resistance to foliar leaf diseases showed the greatest yield benefit from the Tilt application. However, some cultivars that have low resistance to leaf rust and septoria leaf spot also yielded the highest even though no fungicide was applied. Evidently, some early maturing cultivars can complete the grain filling process even though flag leaves are moderately infected with foliar diseases.

Table 1. Effects of Planting Date and Fungicide Treatment on Grain Yield and Test Weight of Selected Winter Wheats, SEK Branch Station, 1987.

Brand Variety	Grain Yield				Test Weight			
	Fungicide		Fungicide		Fungicide		Fungicide	
	No	Yes	No	Yes	No	Yes	No	Yes
	October Planting		November Planting		October Planting		November Planting	
	bu/A				lb/Bu			
Agripro Thunderbird	66.2	66.3	57.3	57.5	59.1	59.6	60.1	60.5
Agripro Victory	55.6	60.0	48.1	52.6	55.7	56.9	55.9	56.5
Arkan	50.7	52.9	48.5	47.5	56.8	56.7	57.1	56.8
Bounty 122	58.4	63.4	43.0	49.9	56.5	57.5	55.9	56.8
Chisholm	67.0	72.6	60.6	66.1	58.6	58.9	58.0	59.2
Garst HR-48	52.4	59.1	42.4	49.6	55.7	56.8	56.0	57.3
Pioneer 2157	51.6	57.7	46.8	54.0	59.1	59.4	59.2	59.8
Rohm & Haas 830	51.7	54.7	30.9	36.0	59.8	59.7	57.6	58.2
Siouxland	59.0	57.3	49.4	47.3	57.7	57.7	57.2	57.7
Tam 107	57.5	65.8	56.7	60.5	55.9	57.2	55.7	57.5
Caldwell	65.2	71.8	61.6	58.7	56.2	56.8	55.9	56.2
McNair 1003	56.3	57.8	32.2	36.7	54.4	54.7	52.7	53.7
(Means)	57.7	61.6	48.1	51.4	57.1	57.7	56.8	57.5
<u>LSD .05</u>		(Oct.)	(Nov.)		(Oct.)	(Nov.)		
Any comparison:		5.6 bu/A	6.6 bu/A		1.0 lb/Bu	0.8 lb/Bu		
Varieties within same fungicide:		4.4 bu/A	5.5 bu/A		0.8 lb/Bu	0.6 lb/Bu		
C.V.		4.4%	6.5%		0.9%	0.6%		

Planting dates: Oct. 21 and Nov. 24, 1986

Fungicide treatment: Tilt, 4 fl. oz./A on April 27 (Oct. planting) and May 1 (Nov. planting).

Table 2. Effects of Planting Date and Fungicide Treatment on Lodging, Height, and Maturity of Selected Winter Wheats, SEK Branch Station, 1987.

Brand Variety	<u>Lodging</u>		<u>Height</u>		<u>Heading Date</u>	
	Planting Date		Planting Date		Planting Date	
	Oct.	Nov.	Oct.	Nov.	Oct.	Nov.
	-- % --		--- In. ---			
Agripro Thunderbird	3	1	32	33	May 4	May 6
Agripro Victory	0	0	32	32	May 5	May 8
Arkan	32	0	32	32	May 2	May 5
Bounty 122	0	0	30	29	May 2	May 5
Chisholm	2	0	29	27	April 30	May 3
Garst HR-48	0	0	29	29	May 2	May 5
Pioneer 2157	0	0	27	28	May 2	May 5
Rohm & Haas 830	7	6	36	36	May 6	May 11
Siouxland	11	4	37	36	May 2	May 6
Tam 107	3	0	29	29	April 30	May 3
Caldwell	4	2	33	33	May 3	May 6
McNair 1003	3	1	33	32	May 4	May 9
(Means)	5	2	32	31	-----	-----
LSD .05	11	2	2	2	-----	-----

Table 3. Effects of Planting Date and Fungicide Treatment on Grain Protein of Selected Winter Wheats, SEK Branch Station, 1987.

Brand	Variety	Fungicide					
		October Planting			November Planting		
		No	Yes	Avg.	No	Yes	Avg.
		----- % -----					
Agripro	Thunderbird	12.6	12.9	12.7	13.9	14.2	14.1
Agripro	Victory	13.0	12.8	12.9	13.0	13.3	13.2
Arkan		13.1	13.2	13.1	14.1	14.3	14.2
Bounty	122	11.4	11.1	11.2	14.0	14.2	14.1
Chisholm		11.0	11.4	11.2	12.5	12.6	12.5
Garst	HR-48	14.0	14.4	14.2	14.1	13.9	14.0
Pioneer	2157	13.8	13.5	13.7	13.4	13.7	13.6
Rohm & Haas	830	11.5	11.7	11.6	13.0	13.3	13.2
Siouxland		11.6	11.8	11.7	13.6	13.3	13.5
Tam	107	12.5	12.0	12.2	12.4	12.4	12.4
Caldwell		11.6	11.3	11.5	12.4	12.3	12.4
McNair	1003	12.2	12.6	12.4	14.3	14.4	14.4
	(Means)	12.4	12.4	12.4	13.4	13.5	13.4
<u>LSD .05</u>							
Comparing variety means averaged							
over fungicide treatment:							
Fungicide treatment:							
C.V.							

Table 4. Effects of Planting Date and Fungicide Treatment on Leaf Disease Rating of Selected Winter Wheats, SEK Branch Station, 1987.

Brand Variety	<u>Leaf Rust Rating</u>				<u>Leaf Septoria Rating</u>			
	<u>Fungicide</u>				<u>Fungicide</u>			
	<u>No</u>	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>	<u>Yes</u>
	October	October	November	November	October	October	November	November
	Planting	Planting	Planting	Planting	Planting	Planting	Planting	Planting
Agripro Thunderbird	1.1	1.0	1.1	1.0	1.9	1.3	1.7	1.2
Agripro Victory	1.1	1.0	1.1	1.0	1.9	1.2	1.8	1.1
Arkan	1.3	1.0	1.1	1.0	1.9	1.5	1.8	1.2
Bounty 122	1.8	1.0	1.6	1.0	2.2	1.2	2.3	1.2
Chisholm	2.6	1.0	3.2	1.1	3.4	1.4	4.0	1.4
Garst HR-48	2.4	1.0	2.0	1.0	3.2	1.3	3.5	1.3
Pioneer 2157	2.0	1.0	2.4	1.0	2.5	1.3	3.2	1.3
Rohm & Haas 830	1.0	1.0	1.2	1.0	1.5	1.2	2.2	1.4
Siouxland	1.0	1.0	1.0	1.0	1.6	1.2	1.9	1.3
Tam 107	3.3	1.1	3.0	1.1	3.8	1.5	3.8	1.6
Caldwell	1.2	1.0	1.0	1.0	1.7	1.1	2.1	1.1
McNair 1003	1.3	1.0	1.3	1.0	1.7	1.2	2.3	1.3
<u>(Means)</u>	1.7	1.0	1.7	1.0	2.3	1.3	2.6	1.3
<u>LSD .05</u>	(Oct.)		(Nov.)		(Oct.)		(Nov.)	
Any comparison:	0.4		0.3		0.4		0.5	
Comparing varieties								
within same fungicide:	0.3		0.3		0.4		0.5	
C. V.	14.9%		12.8%		12.3%		15.1%	

Leaf disease rating: 1 = no diseases on flag leaf; 5 = flag leaf completely covered with leaf diseases.

Fungicide treatment: Tilt, 4 fl. oz./A on April 27 (Oct. planting) and May 1 (Nov. planting).

EFFECTS OF CROPPING SEQUENCE ON SOYBEAN YIELDS

Kenneth Kelley

Summary

Full-season soybean yields were compared for four different cropping rotations: (1) [wheat - doublecrop soybeans] - soybeans, (2) grain sorghum - soybeans, (3) wheat - fallow - soybeans, or (4) continuous soybeans. There have been no significant yield differences over a 6-year period when soybeans follow wheat, grain sorghum, or a wheat - doublecrop rotation. However, grain yield of continuous soybeans has been significantly lower, even though phosphorus and potassium fertilizers were applied annually.

Introduction

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 long-term agronomic effects of cropping sequences on full-season soybeans.

Experimental 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. Full-season soybean yields were compared across all four cropping systems in even-numbered years. Beginning in 1984, an identical study was started adjacent to the initial site so that full-season yield effects could also be compared in odd-numbered years. All rotations received the same amount of phosphorus and potassium fertilizer (80 lbs/A), which was applied to the crop proceeding full-season soybeans.

Results

Effects of four different cropping sequences on soybean yields and soil properties are shown in Table 1. Continuous soybeans typically have yielded 2 to 4 bu/A less than the other cropping rotations. Soil test values have not changed significantly since the beginning of the study, although it appears that in the continuous soybean rotation, the phosphorus level is gradually becoming higher. Also, soil and leaf samples were analyzed to determine if the crop rotations had any effect on the level of charcoal rot disease. Results indicated no significant differences in charcoal rot populations in 1987.

Table 1. Effects of Four Different Cropping Sequences on Soybean Yields and Soil Properties, Columbus Field.

Cropping Sequence	Yield		Leaf Nutrients			Soil Level	
	1987	6-yr Avg	N	P	K	P	K
	-- bu/A --		-----	%	-----	-- lb/A --	
Soybeans following <u>Wheat-doublecrop Soy</u>	30.7	22.8	5.26	0.272	0.78	34	150
Soybeans following <u>Grain Sorghum</u>	31.5	23.4	5.38	0.274	0.95	43	133
Soybeans following <u>Wheat</u>	33.2	23.9	5.47	0.290	0.85	31	150
Soybeans following <u>Soybeans</u>	28.2	21.1	5.22	0.278	0.76	43	160
LSD 0.10	3.8	----	n.s.	0.130	n.s.	10	n.s.
C.V., %	6.1	----	3.3	2.4	10.3	13	10

Soil data represents the nutrient level after the 1986 fall harvest.

EFFECTS OF WHEAT AND SOYBEAN CROPPING SEQUENCES ON SOYBEAN YIELD

Kenneth Kelley

Summary

Three different cropping sequences involving wheat and soybeans have been compared from 1982-87. The rotations include: (1) continuous doublecropping, (2) doublecropping once every 2 years, or (3) full-season crops with no doublecropping. Over the 7-year period, doublecropped soybeans have averaged 5 to 7 bu/A less than full-season soybeans. Highest full-season soybean yields have been produced following 2 years of wheat.

Introduction

In southeastern Kansas, producers often rotate wheat after soybeans, or doublecrop soybeans are planted following wheat harvest. Management practices of one crop, therefore, may affect the production of the next crop. The objectives of this study are to evaluate the effects of doublecropping and the risk factor associated with a particular cropping rotation.

Experimental Procedure

Beginning in 1981, three different wheat and soybean cropping rotations were established at the Parsons Field: 1) [wheat - doublecrop soybeans], 2) [wheat - doublecrop soybeans] - soybeans, and 3) full-season soybeans following 2 years of wheat. Wheat straw has been burned and then disced prior to planting doublecrop soybeans. Soybeans of group III or IV maturity have been used for doublecropping, whereas group V soybeans are planted in full-season rotations. When wheat has been winter-killed or was not planted in the fall because of wet soil conditions, spring oats were planted in late winter.

Results

Soybean yields have been very variable over the 7-year period, depending on the amount of available soil moisture during the critical reproductive stage of soybean development. Doublecrop soybean stands also have been dependent upon adequate soil moisture at the time of planting; however, 1984 was the only year when doublecropping was a complete failure. Soybean yields for the 7-year period are shown in Table 1. Climatic conditions have been very unfavorable for wheat production in the past 3 years, so wheat results are not shown. Economic risk analyses have been performed on the preliminary crop rotation data by Dr. Robert Burton, Department of Ag Economics, KSU. An in-depth risk analyses will be performed after 10 years of data collection.

Table 1. Effects of Wheat and Soybean Cropping Sequences on Soybean Yield.

Crop Sequence	Soybean Yield							
	1981	1982	1983	1984	1985	1986	1987	7-yr avg
	----- bu/A -----							
[Wheat - <u>doublecrop soy</u>]	18.7	23.6	17.9	2.1	33.2	19.9	19.5	19.2
[Wheat - <u>doublecrop soy</u> - <u>full-season soy</u>]	18.0	23.0	16.9	2.0	31.6	17.6	19.3	18.4
[Wheat - <u>doublecrop soy</u> - <u>full-season soy</u>]	25.8	24.3	15.5	11.1	32.6	21.2	35.4	23.7
Wheat - wheat - <u>full-season soy</u>	25.7	24.9	14.5	12.8	32.1	23.9	42.6	25.2
LSD 0.05	3.7	n.s.	n.s.	2.9	n.s.	3.8	2.5	----

Full-season and doublecrop soybeans were planted on the same dates in 1982 and 1985.



**COMPARISONS OF TILLAGE METHODS FOR DOUBLECROP SOYBEANS AND
SUBSEQUENT EFFECTS ON FULL-SEASON SOYBEANS**

Kenneth Kelley

Summary

Four tillage methods (plow, burn - disc, disc, and chisel-disc) have been compared for doublecrop soybean production to evaluate both the short- and long-term effects in a wheat and soybean cropping system. Plowing the stubble under has given significantly higher doublecrop yields over a 5-year period. However, none of the tillage methods has affected the yield of the subsequent full-season soybean crop that follows in the rotation.

Introduction

Producers in southeastern Kansas typically grow doublecrop soybeans after wheat, when soil moisture and time permit. Various tillage methods are used, depending to some degree on the type of equipment that is available. The primary goals of doublecropping are to plant soybeans as quickly as possible after wheat harvest and produce acceptable grain yields as economically as possible. However, the long-term effects from the doublecrop tillage methods have not been thoroughly evaluated for shallow, claypan soil conditions.

Experimental Procedure

Beginning in 1982, four tillage methods have been compared for doublecrop soybeans after wheat harvest at the Columbus Field. Tillage methods are: (1) plow under stubble, (2) burn stubble and then disc, (3) disc stubble, and (4) disc - chisel - disc stubble. The tillage study is alternated each year between two different sites, so that the doublecrop tillage methods can be compared yearly, when the cropping rotation is [wheat - doublecrop soybeans] - full-season soybeans. All plots are chiseled in the spring following doublecrop soybeans. Fertilizer is applied only to the wheat crop.

Results

Doublecrop soybean yield (Table 1) has been highest when the wheat stubble was plowed under. Burning the wheat stubble, followed by discing, has not been significantly different than leaving the straw near the soil surface by discing only; however, seed emergence normally has been better when the straw was removed by burning or plowed under. Full-season soybeans (Table 2) that follow in the rotation have not been affected so far by the previous doublecrop tillage method. Effects on soil chemical and physical properties will be monitored after further cropping rotations.

Table 1. Comparison of Tillage Methods for Doublecrop Soybeans, Columbus.

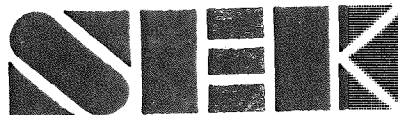
Doublecrop Tillage Method	Doublecrop Soybean Yield					Avg.
	1982	1983	1985	1986	1987	
	----- bu/A -----					
Plov, disc, roller harrow	26.1	25.2	32.9	20.2	18.7	24.6
Burn, disc, field cultiv.	25.8	24.2	32.1	14.7	9.8	21.3
Disc (2x)	26.6	23.2	30.3	15.2	12.8	21.6
No-till	26.3	20.5	24.7	----	----	----
Disc, chisel, disc	----	----	----	15.3	14.4	----
LSD 0.05	n.s.	3.6	4.9	1.3	2.8	----

No yield data in 1984 because of poor stands and summer drought conditions.

Table 2. Effects of Doublecrop Tillage Methods on the Subsequent Yield of Full-Season Soybeans in the Cropping Rotation, Columbus Field.

Doublecrop Soybean Tillage Method	Full-Season Soybean Yield				Leaf Nutrient Conc.		
	1985	1986	1987	Avg.	N	P	K
	----- bu/A -----				----- % -----		
Plov	32.1	25.8	30.7	29.5	5.23	0.259	0.82
Burn, disc	32.5	26.0	29.0	29.2	4.86	0.255	0.80
Disc	32.2	24.7	29.3	28.8	5.23	0.265	0.68
Disc, chisel, disc	33.3	25.7	30.8	29.9	5.24	0.279	0.75
LSD 0.05	n.s.	n.s.	n.s.	----	n.s.	0.006	n.s.

Cropping sequence is a [wheat -doublecrop soybean] - full season soybean rotation. All plots were chiseled in the spring, so the tillage method represents only the doublecrop tillage effect from the previous year.



COMPARISON OF SOYBEAN HERBICIDES FOR COCKLEBUR CONTROL
IN NARROW AND WIDE ROW SPACINGS

Kenneth Kelley

Summary

Soybean herbicides were evaluated for cocklebur control both in narrow (7-inch) and wide (30-inch) row spacings. Treatments that gave the best cocklebur control in 1987 included Scepter (applied preemergent or postemergent) and postemergent applications with Basagran or Classic. Weed control, as well as soybean yield, was significantly improved when one cultivation supplemented the herbicide treatment in 30-inch rows.

Introduction

Cocklebur is one of the major problem weeds in many soybean fields of southeastern Kansas. It is a strong competitor for available water, light, and nutrients. When cockleburs are allowed to compete with the soybean plant for the entire growing season, yields in many cases are reduced by 50% or more, and the weeds also cause mechanical harvesting problems. Our objectives were to evaluate various herbicides and application methods both in narrow and wide row spacing and also to determine the added benefit of cultivation.

Experimental Procedure

Nine herbicide treatments, consisting of preemergent and postemergent application methods, were compared in three management systems - 1) narrow rows (7-inch spacing), 2) 30-inch rows, and 3) 30-inch rows with one cultivation. Herbicides were applied at labeled rates.

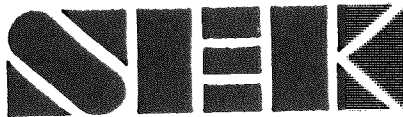
Results

Scepter, applied preemergent or postemergent, gave excellent cocklebur control for the entire growing season (Table 1). However, one cultivation in 30-inch rows increased yields 3 to 5 bu/a, even though weeds were controlled. Canopy, Preview, and Pursuit, when applied preemergent, gave less than satisfactory weed control in 1987; however, weed control was acceptable for these treatments with one cultivation in 30-inch rows. Pursuit has not received full label clearance at this date. Basagran and Classic, applied postemergent, gave better cocklebur control than Cobra. Rescue, applied as a salvage type treatment, also gave good weed control. However, grain yield was reduced with this treatment either because of the longer weed competition with the soybean plants or moderate crop injury from the herbicide treatment.

Table 1. Comparison of Herbicides for Cocklebur and Teaveed Control with Soybeans Planted in Narrow and Wide Row Spacings, Columbus Field, 1987.

Herbicide	Rate	When Applied	Yield			Coch Popul.			Teaveed Control		
			Row Spacing			Row Spacing			Row Spacing		
			N	W	WC	N	W	WC	N	W	WC
	Product/A		-----	bu/A	-----	--	pl/m2	--	-----	%	-----
Canopy	0.5 lb	PRE	25.3	27.3	34.0	5	4	1	95	95	95
Preview	0.5 lb	PRE	28.8	24.8	33.7	7	6	2	95	95	95
Pursuit	0.38 pt	PRE	22.5	28.7	30.8	10	3	1	92	90	92
Scepter	0.67 pt	PRE	28.6	29.4	29.7	1	1	1	95	95	95
Basagran + Liq. N*	1 pt + 1 gal	POST	34.2	29.5	34.1	0	1	1	95	90	95
Classic	0.5 oz	POST	26.1	26.3	32.7	1	2	1	10	10	65
Cobra	0.8 pt	POST	24.4	25.9	32.1	10	6	2	90	85	94
Scepter	0.67 pt	POST	28.5	27.8	33.3	0	0	0	80	80	88
Rescue + Blazer	2 qt + 1 pt	POST	20.9	21.4	28.4	0	0	0	10	10	65
No Herbicide	-----	----	14.0	13.2	19.1	19	16	7	5	0	70
(Means)			25.3	25.4	30.8	5	4	2	67	65	85
<u>LSD :05</u>											
Row spacing				*			*			*	
Herbicide treatment				*			*			*	
Row sp x herb trt interaction				n.s.			*			*	
Herbicide trt within same row spacing			4.4			4			5		
Any comparison				7.0			5			6	

* Basagran + Liq. N treatment was applied on two different dates to give full-season control.
 Variety: Pershing, planted June 12, 1987.
 Row spacing: N = 7-inch, W = 30-inch, WC = 30-inch + one cultivation.
 Date of herbicide applications: Preemergent = June 12; postemergent = June 26 and July 20.



COMPARISONS OF HERBICIDES AND APPLICATION METHODS
FOR VELVETLEAF CONTROL IN SOYBEANS

Kenneth Kelley

Summary

Sixteen different herbicides and application methods were compared for velvetleaf control in soybeans. All treatments provided excellent weed control in 1987, when applied according to label instructions.

Introduction

Velvetleaf has become a serious broadleaf weed problem in many fields of southeastern Kansas. When the velvetleaf population is moderately heavy and germinates at the same time as soybeans emerge, it competes with soybeans for available light and soil moisture and can reduce yields significantly. Our objective in this study was to evaluate many of the newer soybean herbicide products and application methods for control of velvetleaf.

Experimental Procedure

Preplant incorporated treatments were applied with a field cultivator prior to planting. Incorporated and preemergent herbicide treatments were applied on the same day as soybeans were planted. Postemergent treatments were applied 16 days later, when velvetleaf was in the 2- to 4-leaf stage of growth. Soil texture was a Parsons silt loam with 1.3% organic matter.

Results

Velvetleaf control was good to excellent for all herbicide comparisons in 1987 (Table 1). Soil moisture was ideal for the activation of preplant and preemergent treatments, and velvetleaf was growing actively when postemergent treatments were applied.

Soybean yield was reduced somewhat when Scepter was applied preplant; however, yields were not affected with the preemergent treatment. The yield reduction associated with the preplant application of Scepter has been observed before on light textured soils.

Postemergent herbicide treatments were improved in 1987 when liquid 28% nitrogen was added to the tankmix at the rate of 1 gallon per acre. For velvetleaf to be controlled successfully with postemergent applications, weed size should not exceed the 2- to 4-leaf stage of growth.

Table 1. Comparison of Soybean Herbicides for Velvetleaf Control, Columbus Field, 1987.

Herbicide	Rate	When Applied	Yield	Velvetleaf Control
	lb a.i./A		bu/A	%
Canopy	.28	S. PPI	27.7	97
Command	.75	S. PPI	30.2	98
Preview	.33	S. PPI	27.8	96
Pursuit	.063	S. PPI	28.5	97
Scepter	.125	S. PPI	23.1	97
Sencor	.25 + .25	PPI + PRE	32.0	98
Canopy	.28	PRE	27.4	97
Gemni	.6	PRE	27.6	98
Lorox (+)	.6	PRE	27.2	97
Lorox + Lexone	.38 + .25	PRE	30.8	98
Preview	.33	PRE	26.8	98
Pursuit	.063	PRE	28.1	98
Scepter	.125	PRE	28.3	95
Basagran + Liq. N	.75 + 1 gal	POST	29.7	90
Classic + Liq. N	.008 + 1 gal	POST	29.6	91
Cobra + Liq. N	.20 + 1 gal	POST	28.7	90
No herbicide	-----	----	16.8	0
LSD .05:			5.0	3
C.V., %			10.8	5

Variety: Pershing

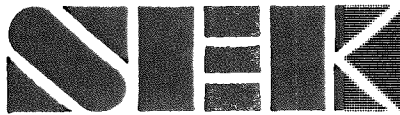
Date of planting: June 10, 1987

Date of herbicide treatments: June 10 (PPI and PRE); June 26 (POST)

S. PPI = shallow preplant incorporated; PRE = preemergent;

POST = postemergent.

Treflan was applied preplant incorporated for grass control.



COMPARISONS OF SOYBEAN HERBICIDES AND
APPLICATION METHODS FOR ANNUAL WEED CONTROL

Kenneth Kelley

Summary

Preplant incorporated, preemergent, and postemergent soybean herbicides were compared to evaluate weed control, crop tolerance, and effects on soybean grain yield. Annual grass and broadleaf weed control was generally good to excellent for most herbicide tankmixes.

Introduction

Annual grass and broadleaf weeds can become serious problems for soybean producers in southeastern Kansas. When weeds compete for available light, water, and soil nutrients during the entire growing season, soybean yields are often reduced significantly. Crop rotations are helpful in breaking some weed cycles, but proper selection and application of herbicides are essential for obtaining optimum soybean yields in most fields. Herbicide performance studies are useful to compare the currently labeled products for the climatic conditions of southeastern Kansas.

Experimental Procedure

The site was a Parsons silt loam with 1.3% organic matter and a soil pH of 6.8. Preplant treatments were incorporated with a field cultivator on the same day as planting. Preemergent treatments were applied immediately after planting. Postemergent treatments were delayed until 30 days after planting because of delayed weed emergence. Major weed species included smooth pigweed, cocklebur, large crabgrass, and fall panicum.

Results

Results of herbicide comparisons are shown in Tables 1, 2, and 3. Smooth pigweed and grass control was good to excellent for nearly all treatments. Cocklebur control was more variable, since some of the tankmixes were not labeled for that particular weed.

Slight to moderate crop injury effects were observed with some of the herbicide comparisons. When Scepter was applied preplant incorporated, soybean plants showed stunted growth during the growing season, which was reflected in somewhat lower yield. However, neither preemergent nor postemergent treatments with Scepter affected crop growth or grain yield.

Pursuit has not received clearance for soybean use at this date and will likely be targeted for postemergent broadleaf weed control. However, it was tested as a preplant incorporated and preemergent treatment in our comparisons in 1987. Cinch also has not received clearance at this date. In our trials, Cinch was evaluated as a preemergent treatment for annual grass control.

Excellent annual grass control and good pigweed control were obtained with all of the dinitroaniline, preplant incorporated herbicides (Treflan, Prowl, and Sonalan). Lasso and Dual, used as shallow preplant incorporated or preemergent applications, also gave excellent grass and pigweed control.

Command, applied preplant incorporated, is an excellent herbicide for annual grass and velvetleaf control, although it is weak on pigweed control. Scepter, Canopy, and Preview are newer broadleaf soybean herbicides that can be applied preplant incorporated or preemergent. These newer herbicides gave excellent pigweed control; however, Scepter seems to give better cocklebur control, whereas Canopy and Preview provide better control of velvetleaf.

Lorox (+) and Gemni are newer preemergent herbicides for broadleaf weed control. Both gave excellent pigweed control and good control of velvetleaf and cocklebur. For the light-textured soils of southeastern Kansas, Lorox (+) would likely result in less crop injury, whereas Gemni would be preferred for finer textured soils. Metribuzin (Sencor/Lexone), applied preplant incorporated or preemergent, provides a broad spectrum of weed control for many soybean fields, when cocklebur is not the major weed competitor.

Postemergent treatments in southeastern Kansas typically are applied for broadleaf weed control. The key to successful weed control with postemergent herbicides is to spray when the weeds are small and actively growing. Basagran and Blazer/Tackle have been used successfully in the past for cocklebur and pigweed control, respectively. Several newer herbicides also can be applied postemergent, depending on the weed species that is to be controlled. Classic gave excellent control of cocklebur and good control of pigweed and velvetleaf. Cobra, another newer postemergent herbicide, gave excellent pigweed control and fair to good control of cocklebur and velvetleaf. Leaf burning normally is more severe initially with Cobra, but the soybean plants soon resume normal growth, and yield has not been reduced in our trials. Scepter also gave good postemergent control of cocklebur. The tankmix of Rescue + Blazer gave good control of cocklebur and pigweed, but this treatment should not be applied when soybeans are under drought stress or yield may be reduced.

Annual grass control can also be obtained with the newer postemergent soybean herbicides. However, they are probably better suited for control of perennial grasses, such as johnsongrass, and of shattercane, which is an annual grass problem when soybeans are cropped after several years of growing grain sorghum. Fusilade 2000, Poast, Verdict, and Assure have similar chemical properties, and all provided excellent large crabgrass control. They also should be applied when the grass is actively growing, and crop oil should be added to the tankmix to improve control. Crop tolerance to these newer postemergent grass herbicides is excellent.

Table 1. Comparisons of Preplant Soybean Herbicides for Weed Control, Columbus Field, 1987.

Herbicide	Rate	When Applied	Yield	Weed Control		
				Smpv	Grass	Coch
	lb a.i./A		bu/A	-- % --		pl/m2
Prowl + Sencor	1.0 + .375	PPI	23.2	95	94	1
Treflan + Command	.75 + .5	PPI	28.7	93	98	2
Salute	1.125	PPI	24.1	98	94	1
Squadron	.87	PPI	18.6	98	98	0
Sonalan + Scepter	.75 + .125	PPI	18.3	98	93	0
Sonalan + Canopy	.75 + .28	PPI	21.7	98	89	<1
Treflan + Canopy	.75 + .28	PPI	21.2	98	91	1
Command + Preview	.75 + .28	S. PPI	27.5	98	96	<1
Lasso + Preview	2.0 + .28	S. PPI	24.9	98	95	<1
Lasso + Pursuit	2.0 + .063	S. PPI	25.7	97	91	<1
Turbo	2.0	S. PPI	23.5	93	95	3
Dual + Scepter	1.5 + .125	S. PPI	21.0	98	94	0
No Herbicide	-----	----	15.4	0	0	2
LSD. 05			6.0	3	5	-
C.V., %			15.0	3	4	-

Variety: Pershing

Planting date: June 9, 1987

Date of herbicide treatments: June 9, 1987

Weed species: Main competition from smooth pigweed (Smpv) and grassy weeds (large crabgrass and fall panicum). Cocklebur (Coch) was less competitive. PPI = preplant incorporated; S. PPI = shallow preplant incorporated.

Table 2. Comparisons of Preemergent Soybean Herbicides for Weed Control, Columbus Field, 1987.

Herbicide	Rate	When Applied	Yield	Weed Control		
				Smpw	Grass	Cocb
	lb a.i./A		bu/A	-- % --		pl/m2
Lasso + Canopy	2.0 + .28	PRE	31.8	98	94	<1
Dual + Preview	1.5 + .28	PRE	33.3	98	98	<1
Lasso + Preview	2.0 + .28	PRE	35.7	98	97	<1
Lasso + Scepter	2.0 + .125	PRE	32.4	98	94	0
Surflan + Scepter	.75 + .125	PRE	29.5	97	91	0
Cinch + Preview	.75 + .28	PRE	31.2	97	97	<1
Dual + Pursuit	1.5 + .063	PRE	31.7	98	98	1
Dual + Lorox	1.5 + .5	PRE	35.1	98	98	1
Lasso + Lorox (+)	2.0 + .6	PRE	32.4	98	98	<1
Dual + Lorox (+)	1.5 + .6	PRE	35.2	98	97	<1
Dual + Gemni	1.5 + .6	PRE	33.1	98	96	<1
Lasso + Sencor	2.0 + .3	PRE	33.2	98	97	<1
No Herbicide	-----	---	20.1	0	0	1
LSD. 05:			5.5	2	2	-
C.V., %			10.0	1	2	-

Variety: Pershing

Planting date: June 9, 1987

Date of herbicide treatment: June 9, 1987

Weed species: Main competition from smooth pigweed (Smpw) and grassy weeds (large crabgrass and fall panicum). Cockerbur (Cocb) was less competitive.

Table 3. Comparisons of Postemergent Soybean Herbicides for Weed Control, Columbus Field, 1987.

Herbicide	Rate	When Applied	Yield	Weed Control		
				Smpw	Cocb	Grass
	lb a.i./A		bu/A	-----	%	-----
Blazer + Basagran	.25 + .5	POST	30.7	92	95	98
+ Poast	.188	POST				
Classic	.008	POST	33.8	84	96	98
+ Assure	.1	POST				
Cobra	.2	POST	31.9	96	80	97
+ Fusilade 2000	.188	POST				
Pursuit	.094	POST	32.2	88	90	98
+ Verdict	.125	POST				
Reflex + Basagran	.25 + .5	POST	32.2	89	90	98
+ Fusilade 2000	.188	POST				
Rescue + Blazer	.25 + .25	POST	28.6	79	95	98
+ Verdict	.125	POST				
Scepter	.125	POST	34.7	88	95	97
+ Poast	.188	POST				
Tackle + Scepter	.25 + .06	POST	31.5	82	90	98
+ Assure	.1	POST				
Dual + Basagran	1.5 + .5	PRE + POST	31.5	98	94	96
Dual + Classic	1.5 + .008	PRE + POST	32.8	98	96	93
Lasso + Cobra	1.5 + .2	PRE + POST	31.0	98	75	88
Lasso + Scepter	1.5 + .125	PRE + POST	32.6	98	95	91
No Herbicide	-----	----	19.5	0	0	0
LSD .05:			4.1	6	5	5
C.V., %			8.0	4	5	4

Variety: Pershing

Planting date: June 9, 1987

Date of herbicide treatment: July 9 (postemergent grass herbicides);
July 15 (postemergent broadleaf herbicides).

Surfactant (AG-98) was added to postemergent broadleaf treatments at the rate of 0.25 %; crop oil (1%) was added to postemergent grass treatments.

Weed species: Main competition from smooth pigweed (Smpw) and grassy weeds (large crabgrass and fall panicum). Cocklebur (Cocb) was less competitive.



EFFECTS OF APPLICATION TIME FOR PREPLANT SOYBEAN HERBICIDES

Kenneth Kelley

Summary

Soybean herbicide tankmixes that were applied 4 weeks ahead of planting as preplant, incorporated applications gave good to excellent weed control with less crop injury compared to the same applications made immediately prior to planting.

Introduction

Some preplant incorporated herbicides, such as the dinitroanilines (Treflan, Prowl, Sonalan), are often applied with a tillage operation several weeks prior to planting. However, it is not known whether the newer broadleaf soybean herbicides that are currently being marketed could also be applied at the same time as the incorporated grass herbicide without sacrificing weed control. In addition, less crop injury might occur if the time period between herbicide application and planting date were lengthened.

Experimental Procedure

Selected soybean herbicide tankmixes were compared at two different application times: 1) 4 weeks prior to planting and 2) immediately ahead of planting. All preplant treatments were incorporated with a field cultivator. The soil site was a silty clay loam with 1.5% organic matter and a soil pH of 6.9. Also, several postemergent herbicide treatments were included.

Results

Grass control with the dinitroaniline herbicides was good to excellent for both application times (Table 1). However, broadleaf weed control was more variable, depending on the herbicide tankmix treatment. Pigweed control was poor when Sonalan was applied 4 weeks prior to planting as compared to immediately before planting. Also, the Command tankmix gave poor broadleaf weed control when applied 4 weeks ahead of planting, since Command controls primarily annual grass species and velvetleaf. Dinitroaniline tankmixes with Scepter, Canopy, and Preview gave excellent pigweed control, regardless of application time; however, Scepter gave the best cocklebur control among preplant treatments. Both Basagran and Classic gave excellent postemergent cocklebur control. Also, soybean crop injury was reduced when Scepter or Canopy treatments were applied several weeks prior to planting. In 1988, additional herbicide comparisons are planned for different soil types.

Table 1. Comparisons of Preplant Soybean Herbicides and Time of Application, Columbus Field, 1987.

Herbicide	Rate	When Applied	Yield	Weed Control		
				Smpw	Cocb	Grass
	lb a.i./A		bu/A	-----	%	-----
Prowl +	1.0	4 wks PPI	27.4	96	80	87
Cobra	0.2	POST				
Prowl +	1.0	PPI	27.3	96	82	91
Cobra	0.2	POST				
Treflan +	0.75	4 wks PPI	27.7	86	94	89
Classic	0.008	POST				
Treflan +	0.75	PPI	27.9	88	96	90
Classic	0.008	POST				
Sonalan +	0.75	4 wks PPI	20.9	60	96	87
Basagran + Liq. N	0.5 + 1 gal	POST				
Sonalan +	0.75	PPI	26.6	84	96	90
Basagran + Liq. N	0.5 + 1 gal	POST				
Prowl + Scepter	1.0 + 0.125	4 wks PPI	31.7	98	88	90
Prowl + Scepter	1.0 + 0.125	PPI	27.9	98	92	93
Prowl + Command	1.0 + 0.75	4 wks PPI	22.8	73	45	88
Prowl + Command	1.0 + 0.75	PPI	23.5	88	57	91
Prowl + Pursuit	1.0 + 0.063	4 wks PPI	24.9	98	57	89
Prowl + Pursuit	1.0 + 0.063	PPI	29.4	98	90	94
Treflan + Canopy	0.75 + 0.375	4 wks PPI	28.6	98	72	89
Treflan + Canopy	0.75 + 0.375	PPI	28.8	98	88	93
Treflan + Preview	0.75 + 0.375	4 wks PPI	29.1	98	73	93
Treflan + Preview	0.75 + 0.375	PPI	26.5	98	80	95
Fusilade 2000 + Cobra	0.188 + 0.2	POST	26.8	95	80	96
No Herbicide	-----	----	18.1	0	0	0
LSD .05: Any comparison:			3.0	7	15	3
Herbicide trt within same applic date:			1.5	6	11	3

Variety: Pershing, planted June 10, 1987.

Date of herbicide treatment: May 14 (4 wks PPI), June 10 (PPI), July 9 (POST)

Weed species: Smooth pigweed (Smpw), cocklebur (Cocb), and large crabgrass.

EFFECTS OF POSTEMERGENT SPRAY ADDITIVES
FOR LATE-SEASON SOYBEAN WEED CONTROL

Kenneth Kelley

Summary

The addition of crop oil or liquid 28% nitrogen to a postemergent tankmix improved control of late-season pigweed in soybeans, compared to a surfactant tankmix treatment. However, the liquid nitrogen spray additive was not as effective as the surfactant for late-season cocklebur control in soybeans.

Introduction

Postemergent spray applications in soybeans are sometimes delayed because of dry or wet weather conditions in southeastern Kansas. When this happens, weeds are often taller than the optimum size for good postemergent control. The addition of a spray additive to the postemergent tankmix could improve weed control in these situations.

Experimental Procedure

Selected postemergent soybean herbicides were compared with several different spray additives for late-season pigweed control at one site and for late-season cocklebur control at another site. Spray applications were made in mid-July, when weeds were taller than the optimum size for effective control and soil conditions were somewhat droughty.

Results

Herbicide results for the pigweed site are shown in Table 1 and for the cocklebur site in Table 2. Pigweed control was better for the Blazer tankmix and also the Cobra treatment than for the Tackle + Scepter tankmix. Crop oil (1% of spray volume) and liquid 28% N (1 gal/A) improved pigweed control over the AG-98 surfactant treatment. However, both crop oil and liquid nitrogen increased injury to the soybean crop, but the plants soon resumed normal growth, so yields were not reduced.

Three postemergent herbicides (Basagran, Classic, and Scepter) were compared at another site for late-season cocklebur control. Classic and Scepter gave slightly better cocklebur control, but the site also had a moderate population of teaweed, which Basagran controlled. Liquid nitrogen added to the spray mix did not improve cocklebur control significantly over the surfactant treatment for the droughty conditions in 1987.

Table 1. Comparisons of Postemergent Soybean Herbicides and Spray Additives for Late Pigweed Control, Columbus Field, 1987.

Herbicide Treatment Spray Additive	Rate	Yield	Pigweed Control	Crop Injury
	Product/A	bu/A	%	
Blazer + Basagran + 2,4-DB + AG-98	1.5 pt + 1 pt 3 oz + 0.25%	30.3	90	3.0
Blazer + Basagran + 2,4-DB + Crop Oil	1.5 pt + 1 pt 3 oz + 1%	30.2	96	4.0
Blazer + Basagran + 2,4-DB + Liq. N	1.5 pt + 1 pt 3 oz. + 1 gal	28.2	95	4.0
Tackle + Scepter + 2,4-DB + AG-98	1.5 pt + 0.33 pt 3 oz + 0.25%	25.9	61	1.5
Tackle + Scepter + 2,4-DB + Crop Oil	1.5 pt + 0.33 pt 3 oz + 1%	23.2	79	2.5
Tackle + Scepter + 2,4-DB + Liq. N	1.5 pt + 0.33 pt 3 oz + 1 gal	23.8	82	2.4
Cobra + 2,4-DB + AG-98	0.8 pt 3 oz + 0.25%	28.7	93	3.0
Cobra + 2,4-DB + Crop Oil	0.8 pt 3 oz + 1%	27.2	96	4.7
Cobra + 2,4-DB + Liq. N	0.8 pt 3 oz + 1 gal	27.4	96	4.0
No Herbicide		18.2	0	1.0
<u>Means:</u>				
Blazer + Basagran		29.6	94	3.7
Tackle + Scepter		23.6	74	2.1
Cobra		27.8	95	3.9
Surfactant (AG-98)		27.6	81	2.5
Crop Oil		26.9	90	3.7
Liquid 28% Nitrogen		26.5	91	3.5
<u>LSD .05:</u>				
Herbicide treatment means:		3.8	16	0.2
Any comparison:		4.4	17	0.2
Comparing spray additives within herbicide:		3.1	6	0.2
C.V., %		6.0	4	4.0

Variety: Pershing, planted June 10, 1987.
 Date of herbicide application: July 15; weed height = 12 to 18 inches.
 Crop injury rating (July 18): 1 = no injury, 5 = top leaves severely burned.

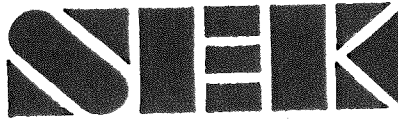
Table 2. Comparisons of Postemergent Soybean Herbicides and Spray Additive for Late Cocklebur Control, Columbus Field, 1987.

Herbicide	Spray Additive	Rate	Yield	Weed Control		
				Cocb	Tea W.	
		Product /A	bu/A	---	%	---
Basagran + 2,4-DB + AG-98		1.5 pt + 2 oz + .25%	22.2	78	82	
Basagran + 2,4-DB + Liq. N		1.5 pt + 2 oz + 1 qt	23.6	80	82	
Basagran + 2,4-DB + Liq. N		1.5 pt + 2 oz + 2 qt	23.6	83	82	
Basagran + 2,4-DB + Liq. N		1.5 pt + 2 oz + 4 qt	23.4	83	82	
Classic + 2,4-DB + AG-98		0.5 oz + 2 oz + .25%	16.2	85	0	
Classic + 2,4-DB + Liq. N		0.5 oz + 2 oz + 1 qt	17.5	88	0	
Classic + 2,4-DB + Liq. N		0.5 oz + 2 oz + 2 qt	16.9	90	0	
Classic + 2,4-DB + Liq. N		0.5 oz + 2 oz + 4 qt	18.3	90	0	
Scepter + 2,4-DB + AG-98		0.5 pt + 2 oz + .25%	20.6	87	30	
Scepter + 2,4-DB + Liq. N		0.5 pt + 2 oz + 1 qt	19.7	87	30	
Scepter + 2,4-DB + Liq. N		0.5 pt + 2 oz + 2 qt	20.5	88	40	
Scepter + 2,4-DB + Liq. N		0.5 pt + 2 oz + 4 qt	19.2	90	40	
No Herbicide		-----	13.8	0	0	
Means:						
Herbicide treatment:						
		Basagran	23.2	81	82	
		Classic	17.3	88	0	
		Scepter	20.0	88	35	
Spray additive:						
		Surfactant (AG-98)	19.6	83	--	
		Liquid N - 1 qt/A	20.3	85	--	
		Liquid N - 2 qt/A	20.3	87	--	
		Liquid N - 4 qt/A	20.3	88	--	
LSD .05:						
Herbicide treatment means:			2.3	--	--	
Any comparison			3.2	--	--	

Variety: Pershing; planted June 12, 1987.

Date of herbicide treatments: July 15; weed height = 6 to 15 inches.

Weed species: Cocklebur (Cocb) and teaveed.



SOUTHEAST KANSAS BRANCH STATION KANSAS STATE UNIVERSITY

COMPARISONS OF GRAIN SORGHUM HERBICIDES FOR WEED CONTROL

Kenneth Kelley

Summary

Grain sorghum herbicides were compared for annual grass and broadleaf weed control using conventional tillage methods. Good to excellent weed control was obtained with nearly all of the preplant and preemergent treatments. Postemergent herbicides gave good control of broadleaf weeds.

Introduction

Grain sorghum is an important grain and feed crop for many producers in southeastern Kansas. It is often grown in rotation with wheat and soybeans, which helps in breaking up the weed cycle that often exists when a monocrop is grown. The use of safened seed treatment has also allowed producers a wider choice of herbicides with the ability to control a wider array of weed species. Our objective was to evaluate grain sorghum herbicides and various tankmixes for weed control and crop injury effects.

Experimental Procedure

Safened grain sorghum seed was planted on a site where the previous crop was grain sorghum. Nineteen herbicide treatments were compared as preplant incorporated, preemergent, and postemergent applications. Preplant treatments were incorporated with a field cultivator equipped with a 3-bar tine mulcher. Weed competition was primarily from smooth pigweed and large crabgrass.

Results

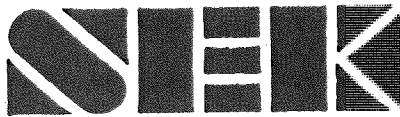
Weed control results and grain yields are shown in Table 1. Lasso and Dual, alone or in combination with Atrazine, gave excellent grass and pigweed control when applied preplant incorporated or preemergent. Atrazine gave significantly better grass control when applied preplant or preemergent as compared to a postemergent application. Ramrod, applied preemergent, has shorter residual activity, although the late grass competition did not reduce grain yield in 1987.

Postemergent treatments with Atrazine and 2,4-D gave excellent pigweed control. However, grass control was poor, which reduced grain yields significantly. Buctril did not cause as much crop injury as 2,4-D when applied postemergent, but it is somewhat weak in controlling pigweed.

Table 1. Comparisons of Grain Sorghum Herbicides for Weed Control, Parsons Field, 1987.

Herbicide Treatment	Rate	When Applied	Yield	Test Wt.	Weed Control		
					Smpv	Grass	
	lb a.i./A		bu/A	lb/bu	----	%	----
AAtrex	1.5	S. PPI	78.0	56.8	100		68
Dual	2.0	S. PPI	84.9	56.8	100		97
Lasso	2.5	S. PPI	87.3	56.8	98		95
Bicep	2.7	S. PPI	80.2	56.7	100		96
Lasso + AAtrex	1.5 + 1.0	S. PPI	85.0	56.8	100		95
AAtrex	1.5	Pre	79.0	56.8	100		68
Dual	2.0	Pre	81.0	56.6	100		98
Lasso	2.5	Pre	89.0	57.4	100		98
Bicep	2.7	Pre	85.1	57.1	100		98
Lasso + AAtrex	1.5 + 1.0	Pre	87.6	56.9	100		97
Ramrod\Atrazine	4.0	Pre	88.4	58.3	100		90
AAtrex	2.0	Post	71.1	56.6	100		25
Buctril	0.25	Post	55.1	56.7	82		0
Buctril + Cultivation	0.25	Post	78.1	57.1	98		40
Buctril + Atrazine	0.25 + 0.50	Post	59.8	56.3	100		15
2,4-D amine + Buctril	0.25 + 0.25	Post	55.9	56.8	100		0
2,4-D amine + Cultivation	0.38	Post	65.6	57.1	100		50
Basagran + AAtrex + COC	0.5 + 0.5	Post	60.8	57.2	100		15
Basagran + AAtrex + 28% N	0.5 + 0.5	Post	61.3	56.8	100		15
Weedy check	---	----	40.2	55.8	0		0
Cultivation only	---	----	52.5	55.4	50		40
LSD 0.05			11.3	1.1	5		10
C.V. %			11.0	2.0	4		12

Date of planting: May 15, 1987 (Garst 5511, safened seed)
 Date of herbicide applications: Shallow preplant (S. PPI) and preemergent (Pre) - May 15; postemergent (Post) - June 5 and 16.
 Weed species: Smooth pigweed (Smpv), large crabgrass, and fall panicum grass.
 Crop injury from the herbicide treatments was only slight, so injury notes are not shown.



ANNUAL SUMMARY FOR PARSONS, KANSAS IN 1987

L. Dean Bark¹

The charts that follow show graphically the daily weather in Parsons during the last 2 years. Each chart has three smooth curves to represent the average weather conditions at Parsons based on 30 years of records from the Experiment Station files. The actual temperature and accumulated precipitation totals that occurred throughout 1986 and 1987 are also plotted by the rough lines on these charts, so that the "weather" can be compared with the climatic averages.

Table 1 summarizes the monthly average values for weather conditions at the station. These values are also compared to the monthly normal values.

As indicated by the charts and table, the weather in Parsons during 1987 was cooler than normal, with above normal precipitation for the year. Unusually heavy snowfalls in January and again in December contributed to an annual total snowfall that was over twice the normal amount; the precipitation total of almost 43 inches was more than 4 inches above the annual average.

Daytime temperatures were cooler than normal for 10 of the 12 months in 1987. Only February and May had mean maximum temperatures that were warmer than normal. October and November were particularly cold, with monthly mean temperatures that were more than 8 degrees below normal.

Temperature extremes for the year ranged from 100°F on 4 days during the early part of August to 0° on December 16th. There were only 5 days during the year when temperatures dipped below 10°F. The last freeze occurred on April 5th, and a temperature of 32°F or less was recorded for the first time in the fall on October 12th, giving a freeze-free period of 180 days.

Precipitation total for the year was above normal for 7 of the 12 months. The cold-season months January-February and November-December had much greater than normal amounts of precipitation. February's total of 4.48 inches was almost an inch more than the previous record (since 1925), which occurred in 1951. Rains were frequent during the growing season and crops suffered water stress less in 1987 than in the past few years. There were 16 stressful days

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in late July and early August, when there was no rain. During this period, temperatures were usually in the upper 90's. However, rainfall during the rest of August was sufficient to relieve water stress.

Total snowfall in Parsons during the year exceeded the previous record of 34.5 inches set in 1958. Two, particularly heavy, snowstorms occurred in southeast Kansas in 1987--one in January and another in December.

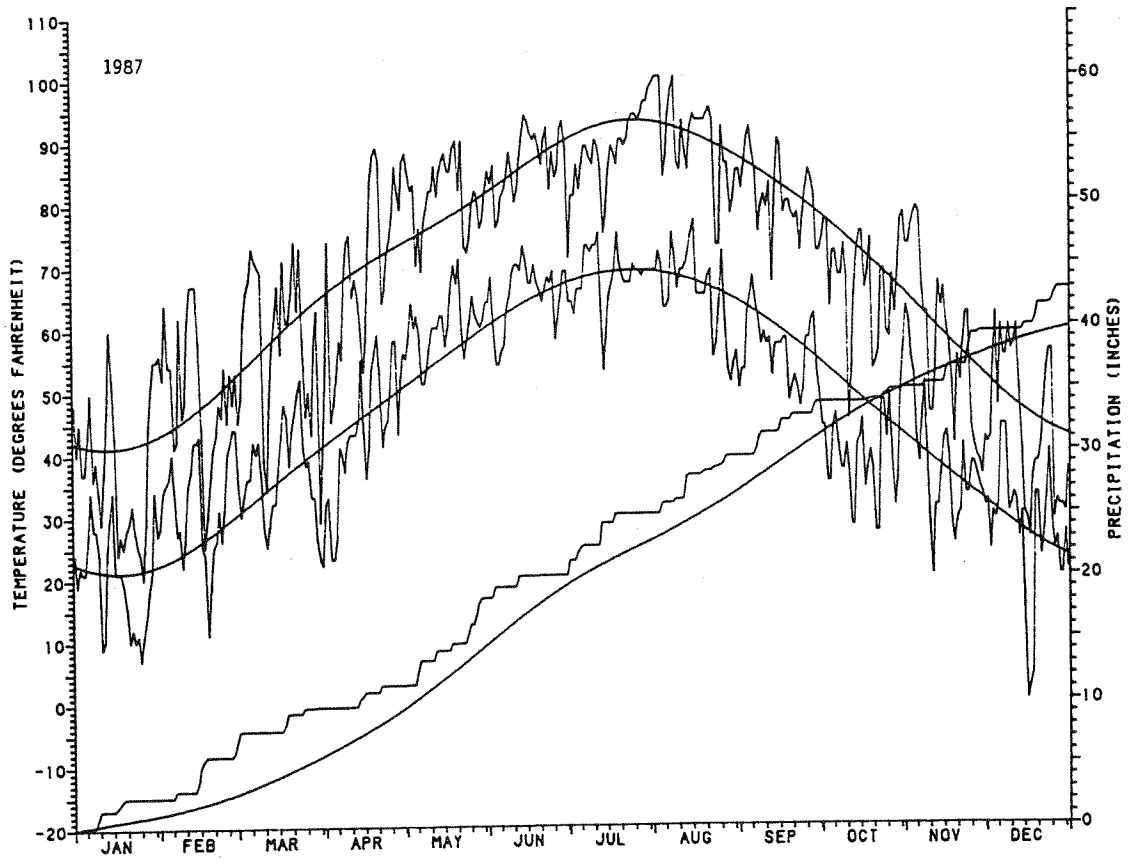
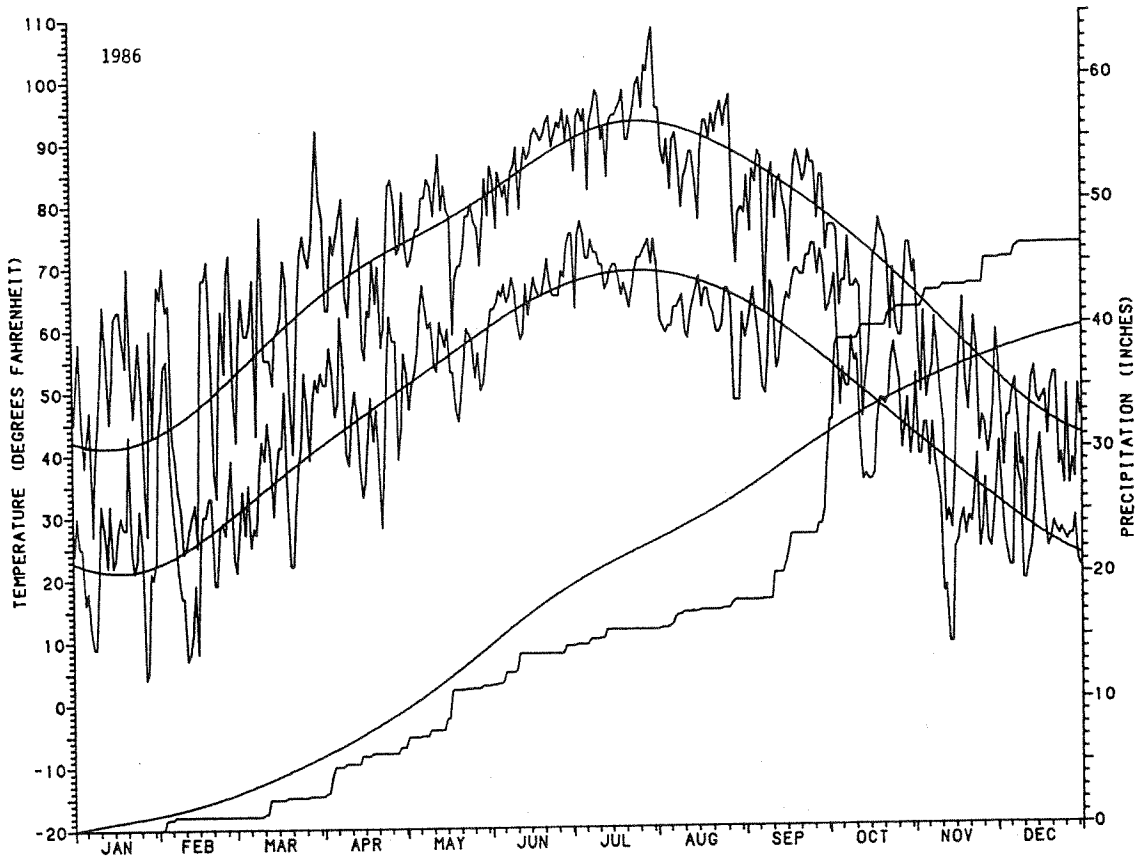
Except for the snow and ice storms during the first and last months of the year, there were no significant storms in this area in 1987. Thunderstorms were frequent, but few would be classed as severe. An intense storm on May 21st produced hail in the vicinity; 3/4 inch hail was reported 6 miles east of Parsons.

Table 1. ANNUAL SUMMARY OF WEATHER DATA FOR PARSONS - 1987

	1987 DATA												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
AVG. MAX TEMPERATURE	37.8	50.1	57.8	69.4	81.2	86.5	87.8	89.6	81.0	66.9	51.7	44.5	67.1
AVG. MIN TEMPERATURE	20.3	32.0	36.6	43.4	60.4	65.2	67.7	65.6	56.1	39.5	27.1	27.0	45.2
AVG MEAN TEMPERATURE	29.1	41.1	47.2	56.4	70.8	75.9	77.8	77.6	68.6	53.2	39.4	35.7	56.1
TOTAL PRECIPITATION	2.51	4.48	2.70	1.69	6.94	1.77	4.87	4.61	4.28	1.11	4.48	3.48	42.92
TOTAL SNOWFALL	25.75	3.5	0	0	0	0	0	0	0	0	0	12	41.25
HEATING DEGREE DAYS	1115.	669.5	552	293	7	0	1	.5	22.5	367	521	907.5	4456.
COOLING DEGREE DAYS	0	0	0	41.5	186.5	326	396.5	398.5	129	2.5	5.5	0	1486

	NORMAL VALUES (1951 - 80 AVERAGE)												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
AVG. MAX TEMPERATURE	42.8	49.3	58.6	70.8	78.8	87.2	93.1	92.2	84.0	73.6	57.9	47.3	69.6
AVG. MIN TEMPERATURE	22.6	27.6	35.5	47.2	56.5	64.9	69.5	67.6	60.3	49.0	36.8	27.8	47.1
AVG MEAN TEMPERATURE	32.7	38.5	47.1	59.0	67.7	76.1	81.3	79.9	72.1	61.3	47.4	37.6	58.4
TOTAL PRECIPITATION	1.22	1.34	2.98	3.72	5.18	4.80	3.65	3.43	4.53	3.47	2.54	1.65	38.51
TOTAL SNOWFALL	3.1	2.9	2	.3	0	0	0	0	0	.1	.7	11.1	20.2
HEATING DEGREE DAYS	1001	742	565	209	59	6	0	0	24	173	528	849	4156
COOLING DEGREE DAYS	0	0	10	29	143	339	505	462	237	58	0	0	1783

	1987 DEPARTURES FROM NORMAL												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
AVG. MAX TEMPERATURE	-5.0	.8	-.8	-1.4	2.4	-.7	-5.3	-2.6	-3.0	-6.7	-6.2	-2.8	-2.5
AVG. MIN TEMPERATURE	-2.3	4.4	1.1	-3.8	3.9	.3	-1.8	-2.0	-4.2	-9.5	-9.7	-.8	-1.9
AVG MEAN TEMPERATURE	-3.6	2.6	.1	-2.6	3.1	-.2	-3.5	-2.3	-3.5	-8.1	-8.0	-1.9	-2.3
TOTAL PRECIPITATION	1.29	3.14	-.28	-2.03	1.76	-3.03	1.22	1.18	-.25	-2.36	1.94	1.83	4.41
TOTAL SNOWFALL	22.7	.6	-2.0	-.3	.0	.0	.0	.0	.0	-.1	-.7	.9	21.05
HEATING DEGREE DAYS	114	-73	-13	84	-52	-6	1	0	-2	194	-7	59	300
COOLING DEGREE DAYS	0	0	-10	13	44	-13	-109	-64	-108	-56	6	0	-297



ACKNOWLEDGMENTS

Listed below are individuals, organizations, and firms that have contributed to this year's research programs through financial support, product donations, or services.

Agri Basics Fertilizer Co., Richardson, TX
Agripro, Mission, KS
Allied Corporation, Hopewell, VA
S.C. Anand, University of Missouri, Portageville, MO
American Cyanamid Co., Wayne, NJ
Asgrow Seed Co., Marion, AR
Asgrow Seed Co., Kalamazoo, MI
BASF Wyandotte Corp., Parsippany, NJ
Berger Seeds, Weiner, AR
Buffalo Farm Equipment Co., Columbus, NE
R. Bussman, Mound Valley, KS
Cargill, Inc., Elk River, MN
Cargill Seed Co., Minneapolis, MN
Casterline Seeds, Dodge City, KS
CIBA-Geigy Corp., Greensboro, NC
Circle Seed Farms, McCune, KS
Coker's Pedigreed Seed Co., Bay, AR
Columbus Chamber of Commerce, Columbus, KS
Coopers Animal Health, Kansas City, MO
Dekalb-Pfizer Genetics, Lubbock, TX
DeLange Seed Co., Girard, KS
Dow Chemical Co., Midland, MI
DuPont Agrichemical Co., Wilmington, DE
Elanco Products Co., Indianapolis, IN
Alvin Epler, Hallowell, KS
Calvin Flaherty, McCune, KS
FFR Cooperative, W. Lafayette, IN
Fluid Fertilizer Foundation, St. Louis, MO
FMC Corp., Philadelphia, PA
Garst Seed Co., Coon Rapids, IA
George Warner Seed Co., Hereford, TX
Great Plains Research, Apex, NC
Hillcrest Farms, Havana, KS
Hoffmann-LaRoche, Inc., Nutley, NJ
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Kansas Soybean Commission, Topeka, KS
Markley Seed Farms, Dennis, KS
Merschman Seeds, West Point, IA
Mobay Chemical Corp., Kansas City, MO
Monsanto Agricultural Products, St. Louis, MO

National Fertilizer Solutions Association, St. Louis, MO
Northern Farm and Garden, Inc., Bemidji, MN
Northrup King Seed Co., Richardson, TX
PAG Seeds, Minneapolis, MN
Parsons Chamber of Commerce, Parsons, KS
Alice M. Parscale, Monett, MO
Pfizer, Inc., Lee's Summit, MO
Pioneer Hi-Bred International, Johnston, IA
Pioneer Hi-Bred International, Lincoln, NE
Potash-Phosphate Institute, Atlanta, GA
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Agricultural Experiment Station, Kansas State University, Manhattan 66506

Report of Progress 543

April 1988

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4-88-2M