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Whole-plant forage and grain sorghums and corn silages for growing cattle

Abstract

Two trials were conducted to determine the feeding value of whole-plant forage sorghum, grain sorghum, and corn silages, with and without 25% rolled grain sorghum added to the ration. In general, growing cattle fed corn or grain sorghum silages out-performed those fed forage sorghum silages. Only forage sorghums with moderate grain yields supported gains approaching those from grain sorghum silages. With the addition of 25% rolled grain sorghum, cattle performance from the low and medium grain-yielding forage sorghum silages was improved greatly (gains by 20 to 44%, dry matter intake by 12 to 17%, feed conversion by 4 to 25%). Adding 25% grain to the moderate grain-yielding forage sorghum hybrid rations increased cattle gains to a level comparable to those from grain sorghum silages. These studies indicate that the grain content of a corn or sorghum silage ration is the major determinant of cattle performance, and that Whole-plant corn and grain sorghums should produce the fastest and most efficient gains in growing programs.

Keywords

Kansas Agricultural Experiment Station contribution; no. 88-363-S; Cattlemen's Day, 1988; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 539; Beef; Forage; Grain sorghum; Corn silages; Growing cattle

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Whole-plant Forage and Grain Sorghums and Corn Silages for Growing Cattle

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Summary

Two trials were conducted to determine the feeding value of whole-plant forage sorghum, grain sorghum, and corn silages, with and without 25% rolled grain sorghum added to the ration. In general, growing cattle fed corn or grain sorghum silages out-performed those fed forage sorghum silages. Only forage sorghums with moderate grain yields supported gains approaching those from grain sorghum silages. With the addition of 25% rolled grain sorghum, cattle performance from the low and medium grain-yielding forage sorghum silages was improved greatly (gains by 20 to 44%, dry matter intake by 12 to 17%, feed conversion by 4 to 25%). Adding 25% grain to the moderate grain-yielding forage sorghum hybrid rations increased cattle gains to a level comparable to those from grain sorghum silages. These studies indicate that the grain content of a corn or sorghum silage ration is the major determinant of cattle performance, and that whole-plant corn and grain sorghums should produce the fastest and most efficient gains in growing programs.

Introduction

Grain sorghum silages generally have the following advantages over their forage sorghum counterparts: (1) higher grain content, which leads to faster daily gains; (2) more crude protein, which lowers supplementation costs; and (3) earlier forage maturity and improved dry-down characteristics, both of which lead to better silage preservation and increased silage intake. Our objectives were to continue our comparisons of forage and grain sorghum and corn silages and to document the performance of growing cattle fed these silages when grain is added to the ration.

Experimental Procedures

Summarized in Table 42.1 are harvest dates, dry matters (DM), and chemical compositions at harvest for the forage sorghum, grain sorghum, and corn hybrids used in the 1985-86 and 1986-87 trials.

In both years, all hybrids were direct-cut using a Field Queen harvester. Forage and grain sorghums were in the late-dough stage of kernel development, and the corn was dented. All silages were made in either 10 x 50 ft and 14 x 60 ft concrete stave silos or 8 x 75 ft Ag Bags®.

In the 1985-86 trial, whole-plant silages were made from four forage sorghum and three grain sorghum hybrids. Each silage was fed to 16 crossbred steer and heifer calves (four pens of three steers and one heifer per ration, with an initial avg. wt. of 538 lb). Two pens received 87.6% silage and 12.4% supplement (DM basis), whereas the remaining two pens received rations containing 62.6% silage,

12.4% supplement, and 25% rolled sorghum grain. Each ration provided 12% CP (DM basis); 200 mg of Rumensin® per calf daily; and calcium, phosphorus, and vitamin A to meet NRC (1984) requirements. The supplements used were soybean meal-based, with 2.5% urea and rolled grain sorghum as the carrier. The rations were fed for 70 days; December 6, 1985 to February 14, 1986.

In the 1986-87 trial, whole-plant silages were made from three grain sorghums, one forage sorghum, and one corn hybrid. Each silage was fed to 16 crossbred steers and heifer calves (four pens of three steers and one heifer per ration, with an initial avg. wt. of 563 lb). The ration and supplement ingredients and percentages were the same as described for the 1985-86 trial. The rations were fed for 80 days; December 12, 1986 to March 1, 1987.

In both trials, calves were weighed on two consecutive days at the beginning and end of the trial, after 16 hr without feed or water. To minimize fill effects, all calves were fed a forage sorghum silage ration at 1.75% of body weight (DM basis) for 1 week before each trial began.

Samples of each silage were taken twice weekly. Feed intake was recorded daily for each pen and the quantity of complete-mixed ration was adjusted daily to assure that fresh feed was always in the bunks. Feed not consumed was removed, weighed, and discarded as necessary.

Results and Discussion

1985-86: Trial 1. The three grain sorghum hybrids (Funk's 550, NK 2778, DeKalb 42Y) produced the highest daily gains (Table 42.2). The moderate grain-yielding forage sorghum hybrids (Buffalo Canex, Acco 351, and Pioneer 947) produced respectable gains of over 2 lb per day. The low-grain yielding forage sorghum hybrid (DeKalb 25E) produced the poorest gain.

With the addition of 25% rolled grain sorghum, the most dramatic improvements in cattle performance were with the forage sorghums. Daily gain of calves fed DeKalb 25E and added grain improved by .61 lb/day, which is a 44% improvement. Calves fed the three moderate grain-yielding forage sorghum hybrids also showed significant increases in daily gains (Buffalo Canex, 31%; Acco 351, 24%; and Pioneer 947, 21% improvements). Calves fed the three moderate grain-yielding forage sorghums had gains and feed conversions comparable to those of calves fed the grain sorghum silages without added grain. Adding grain to the grain sorghum silages had little effect on calf performance.

Calves consumed more of the grain sorghum silage rations than the forage sorghum silage rations and the intake of the low grain-yielding hybrid was quite low (only 2.0% of body wt.). Even after the addition of 25% grain, calves still consumed more of the grain sorghum silage rations, but the largest increases in intake occurred with the forage sorghums. Buffalo Canex and DeKalb 25E showed about 17% improvements, whereas Pioneer 947 and Acco 351 improved by 15 and 12%, respectively. Only calves receiving NK 2778 silage demonstrated any significant improvement in intake among the grain sorghums as a result of grain addition.

Efficiency of gain was virtually the same for all hybrids with the exception of DeKalb 25E silage, which produced the least efficient gains. However, DeKalb 25E was also the only hybrid to give a significant improvement (24%) in efficiency of gain as a result of adding grain. However, after the improvement, the efficiency of gain was still inferior to the other hybrids.

1986-87: Trial 2. The corn silage (Pioneer 3475) and two of the grain sorghum silages (Funk's G-522 and NC+174) produced the fastest cattle gains ($P < .05$), whereas DeKalb 41Y produced a respectable gain of 2.15 lb/day. The moderate grain-yielding forage sorghum hybrid (DeKalb FS-5) produced the slowest ($P < .05$) gain. With the addition of 25% rolled grain sorghum, only calves fed DeKalb 41Y and DeKalb FS-5 showed any improvement in gains (5 and 14%, respectively) but neither was statistically significant.

Calves consumed significantly more of the corn and grain sorghum silage rations than the forage sorghum silage, but the intake of the DeKalb FS-5 was still acceptable (2.44% of body wt.). After the addition of 25% grain, only NC+174 and DeKalb FS-5 silages resulted in a significant increase in consumption; the forage sorghum silage was still consumed at a lower level than either the corn or grain sorghum silage rations.

Efficiency of gain was best with the corn and two of the grain sorghum silages (Funk's G-522 and NC+174). With the addition of 25% grain, only DeKalb 41Y produced an improvement (8%) in feed efficiency. The efficiency of gain of calves fed corn silage actually decreased by 6 percent.

Results from these two trials indicate that grain sorghum silages can produce gains comparable to corn silage and superior to forage sorghum silages. Only forage sorghums with moderate grain-yielding potential can compare favorably to grain sorghums when evaluated on the basis of growing cattle performance. Low grain-yielding forage sorghums, especially without grain added to the ration, may have limited use in growing cattle rations.

The addition of 25% rolled grain sorghum resulted in the greatest improvements of cattle performance with the forage sorghum hybrids. Adding grain to low grain-yielding forage sorghums gave acceptable cattle performance. Grain sorghum and corn silage rations benefitted very little from the addition of 25% rolled grain sorghum and, in some instances, performance was actually decreased. It should be noted that because of wet field conditions, the DeKalb 41Y in the 1986-87 trial was harvested about 10 days to 2 weeks later than intended, and the grain was nearly mature.

A decrease in digestibility of the grain portion of the DeKalb 41Y silage likely explains the lower performance and benefit of additional rolled grain sorghum when compared to the other two grain sorghum silages. In a previous trial, DeKalb 41Y silage produced gains comparable to those with both Funk's G-522 and NC+174 silages.

Table 42.1. Hybrid Types, Harvest Dates, and Dry Matter and Chemical Analyses at Harvest¹

Year, Trial and Hybrid	Hybrid Type	Harvest Date	DM	CP	NDF	ADF
			%	-% of the crop DM-		
<u>1985-86: Trial 1</u>						
Buffalo Canex	Forage ³	Sept. 16	28.0	8.5	54.1	28.9
Acco Paymaster 351	Forage ³	Sept. 26-27	32.6	8.8	61.3	32.5
Pioneer 947	Forage ³	Sept. 27	37.0	8.3	54.1	32.6
DeKalb 25E	Forage ²	Oct. 31	30.4	7.0	58.6	37.8
Funk's 550	Grain	Sept. 16	38.0	11.5	43.5	20.7
Northrup King 2778	Grain	Sept. 19	39.0	10.3	40.4	20.4
DeKalb 42Y	Grain	Oct. 7	44.0	10.3	36.9	19.1
<u>1986-87: Trial 2</u>						
DeKalb FS-5	Forage ³	Sept. 21-22	29.0	7.8	---	---
Funk's G-522	Grain	Aug. 29	34.9	9.8	---	---
NC+174	Grain	Sept. 3	36.0	8.8	---	---
DeKalb 41Y	Grain	Sept. 22	40.1	8.8	---	---
Pioneer 3475	Corn	Aug. 18-20	35.9	7.9	---	---

¹DM = dry matter, CP = crude protein, NDF = neutral detergent fiber, ADF = acid detergent fiber.

²Low grain-yielding forage sorghum.

³Moderate to high grain-yielding forage sorghum.

Table 42.2. Performance by Cattle Fed the Forage, Grain Sorghum, and Corn Silage Rations in 1985-86: Trial 1

Item	Forage Sorghum Hybrid				Grain Sorghum Hybrid		
	DeKalb 25E	Buffalo Canex	Acco 351	Pioneer 947	Funk's 550	NK 2778	DeKalb 42Y
Avg. Daily Gain, lb (w/25% Grain)	1.34 ^d 1.94*	2.09 ^c 2.72*	2.15 ^{bc} 2.66*	2.03 ^c 2.44*	2.53 ^a 2.75	2.46 ^{ab} 2.92*	2.45 ^{ab} 2.76
Avg. Daily Feed, lb ¹ (w/25% Grain)	12.7 ^c 14.9*	14.4 ^b 16.6*	15.0 ^b 16.8*	14.6 ^b 16.8*	17.7 ^a 18.6	17.8 ^a 19.3*	18.1 ^a 18.6
Feed/Gain, lb ¹ (w/25% Grain)	9.6 ^b 7.7*	6.9 ^a 6.1	7.0 ^a 6.3	7.2 ^a 6.9	7.0 ^a 6.7	7.2 ^a 6.6	7.5 ^a 6.7

¹100% dry matter basis.

^{abc}Means differ within a row (P<.05).

*Means differ from the respective base ration (P<.05).

Table 42.3. Performance by Cattle Fed the Forage, Grain Sorghum, and Corn Silage Rations in 1986-87: Trial 2

Item	Forage Sorghum Hybrid	Grain Sorghum Hybrid		Corn Hybrid	
	DeKalb FS-5	DeKalb 41Y	Funk's G-522	NC + 174	Pioneer 3475
Avg. Daily Gain, lb (w/25% Grain)	1.69 ^c 1.92	2.15 ^b 2.26	2.60 ^a 2.61	2.68 ^a 2.69	2.70 ^a 2.70
Avg. Daily Feed, lb (w/25% Grain)	15.4 ^c 17.0*	19.8 ^a 19.3	19.1 ^a 20.3	18.7 ^a 20.7*	17.1 ^b 18.4
Feed Gain, lb ¹ (w/25% Grain)	9.08 ^b 8.87	9.25 ^b 8.60	7.34 ^a 7.81	7.00 ^a 7.66	6.40 ^a 6.77

¹100% dry matter basis.

^{abc}Means differ within a row (P<.05).

*Means differ from the respective base ration by (P<.05).