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Whole-plant Forage, Grain or Non-heading Sorghum  
Silages, Cornlage, and Feed Flavor Supplements  
for Growing Calves <sup>1,2</sup>

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### Summary

Four whole-plant silages produced in 1981 and 1982 were evaluated using 176 calves in two growing trials. Based on comparative rates and efficiencies of gain, feeding values were 115, 100, 78.5, and 62 for the cornlage, grain sorghum, forage sorghum, and non-heading sorghum silages, respectively. The poorer values for the forage and non-heading silages were due, in part, to low feed intakes. Rolling the grain and forage sorghum silages to break 85% to 95% of the kernels did not improve their value, and the good performance by calves suggests that the whole grain was well utilized.. A feed flavor supplement, Omniflavor, did not improve performance in trial 1 but did increase rates and efficiencies of gain in trial 2,

### Introduction

Sorghum silages are often the major energy feeds in cattle growing rations, but limited information is available concerning nutritional values of today's improved hybrids. Also, we had not previously compared non-heading sorghum, grain producing forage sorghum, or grain sorghum-types with corn silage. This was one objective of these trials.

Previously, research at the Hays Branch Expt. Station showed that processing forage sorghum silage did not improve its feeding value. However, research at Manhattan showed that the value of grain sorghum head-chop silage was significantly improved by processing to break 95% of the kernels. A second objective was to compare processed and unprocessed sorghum silages.

Cattle feeders frequently see low dry matter intakes with sorghum silages, especially those that are high in moisture or low in digestibility. Flavor compounds are sometimes used in the feed industry to improve palatability or acceptability of a feed. A third objective was to evaluate the effect of a commercial feed flavor on intake and utilization of silage rations by growing calves.

<sup>1</sup>The feed flavor was Ultra Sweet Livestock Omniflavor, produced by Agrimerica, Inc., Northbrook, IL 60062.

<sup>2</sup>Partial financial assistance was provided by Agrimerica, Inc. and A.O. Smith Harvestore Products, Arlington Heights, IL 60006.

### Experimental Procedures

Trial 1. Three whole-plant silages were made in the fall of 1981: 1) Dekalb FS-25A+forage sorghum; 2) Ferry-Morse 81 grain sorghum; and 3) Ferry-Morse 3020 corn. The harvest dates, dry matters (DM), and grain yields of the three crops are shown in Table 15.1.

Table 15.1. Crops, Harvest Dates, Dry Matter Contents, and Yields, Trials 1 and 2

Trial and crop	Harvest dates	Dry matter at harvest	Grain yield	Forage yield <sup>1</sup>
<u>Trial 1: 1981</u>				
Forage sorghum	Sept. 23, 25, and 28	35.0	73 <sup>e</sup>	--
Grain sorghum	Sept. 16 and 17	37.0	124 <sup>e</sup>	--
Corn	Sept. 1, 4, and 7	54.4	153 <sup>e</sup>	--
<u>Trial 2: 1982</u>				
Non-heading	Oct. 4	23.8	--	24.3 <sup>a</sup>
Forage sorghum	Sept. 23	31.0	84 <sup>e</sup>	21.1 <sup>a</sup>
Grain sorghum	Sept. 20	36.6	110 <sup>e</sup>	18.1 <sup>a</sup>

<sup>1</sup> Adjusted to 30% dry matter.

<sup>a</sup> Actual.

<sup>e</sup> Estimated.

All crops were direct-cut using a Field Queen forage harvester equipped with a 2-inch recutter screen. About 80 to 85% of the sorghum and corn kernels remained whole. Both sorghums were ensiled in 16 x 50 ft concrete stave silos. The corn was ensiled in a 14 x 40 ft Harvestore<sup>®</sup>. The cornlage was also used in another trial (see page 54 of this Progress Report). All three structures were opened during the 1st week of January, 1982.

Five silage rations were compared: each of the three silages fed without further processing (whole), and the forage and grain sorghum silages fed after processing through a Roskamp roller mill to break 85 to 90% of the kernels (processed). Each silage ration was fed to 16 Hereford, Simmental, or Hereford x Angus steer and heifer calves (four pens of four calves per ration). In addition, two pens per silage ration received a supplement containing feed flavor (Omniflavor) at 4.0 lb per ton of complete ration (DM basis). Another two pens, received a control supplement. Each silage was full-fed with 2.0 lb of supplement per calf daily. Rations were formulated to provide 12.5% crude protein (DM basis), 150 mg of monensin per calf daily, and equal amounts of calcium, phosphorus, and vitamin A. The growing trial was 84 days (January 20 to April 20, 1982).

For the 6 weeks before the trial began, all the calves were fed free-choice prairie hay and 3 lb of rolled milo plus soybean meal concentrate. All calves were weighed individually on 2 consecutive days after 16 hr without feed or water, at the start and at the end of the trial. Prior to the final weighings, all calves were fed the same amount of feed (about 10 lb of DM). Intermediate weights were taken before the A.M. feeding on days 28 and 56. The calves were implanted with 36 mg of Ralgro at the start of the trial.

Samples of each silage were taken twice weekly. Feed intake was recorded daily for each of the 20 pens and the quantity of silage fed adjusted daily to assure that fresh feed was always in the bunks. Feed not consumed was removed, weighed, and discarded as necessary.

Trial 2. Three whole-plant silages were made in the fall of 1982: 1) G 1990 non heading hybrid forage sorghum (non-heading sorghum); 2) Pioneer 947 forage sorghum (forage sorghum); and 3) Dekalb E 67 red grain sorghum (grain sorghum). The harvest dates, DM contents, grain, and forage yields are shown in Table 15.1.

All crops were harvested as described in trial 1. The non-heading sorghum and forage sorghum were ensiled in 10 x 50 ft, and the grain sorghum in a 16 x 50 ft concrete stave silo. The silos were opened on November 18 and 19, 1982.

Four silage rations were compared: each of the three silages fed without further processing, and grain sorghum silage fed after rolling to break about 95% of the kernels. Each silage ration was fed to 16 Angus, Angus x Hereford, Angus x Simmental, and Hereford x Simmental steer calves (four pens of four calves per ration). In addition, two pens per silage ration received an Omniflavor supplement (4.4 lb per ton of ration DM for the first 2 weeks, then 2.2 lb per ton for the remaining 6 weeks). Another two pens received a control supplement. The growing trial was 56 days (November 20, 1982 to January 15, 1983).

Four pens of four calves were also fed each of two additional Pioneer 947 forage sorghum silages, one treated with a silage additive and one urea-treated. Two pens from each silage received the Omniflavor supplement, and two pens the control. Rations were formulated, fed, and calves weighed as in Trial 1, except calves were fed hay and concentrate for only 3 weeks before the trial began.

In both trials, statistical analysis showed no interaction between the silage rations and supplement treatments. Therefore, results for silages and supplements are presented separately within each trial.

### Results and Discussion

The seven silages in the two trials were well preserved and free of visible mold, spoilage, or seepage.

Trial 1. Performance of calves receiving the three whole-plant silages are shown in Table 15.2. Cornlage produced the fastest gains and highest intakes ( $P < .05$ ); forage sorghum, the slowest gains and lowest intakes ( $P < .05$ ). Grain sorghum silage and cornlage had better feed efficiencies than the forage sorghum silage. For both forage and grain sorghums, calves fed the processed silages gained slightly faster and consumed slightly more feed than those fed unprocessed silages (Table 15.3). Processing increased feed efficiencies by only 4.4 and 1.2% for the forage and grain sorghum silages, respectively.

Eighty-four day performances by calves fed the control and Omniflavor supplements were nearly identical (Table 15.4). As the trial progressed, calves receiving Omniflavor tended to consume less feed than those not receiving it and, thus, had slightly better feed conversions.

Trial 2. Performances by calves fed the four silages are shown in Table 15.5. The two grain sorghum silages gave the fastest gains and highest intakes ( $P < .05$ ); non-heading sorghum silage, the slowest gain and lowest intake ( $P < .05$ ). Performance by calves fed forage sorghum silage was intermediate, except calves fed forage sorghum made 3.3% more efficient gains than those fed grain sorghum silage. Processing the grain sorghum silage did not improve calf performance.

The Omniflavor supplements improved rates and efficiencies of gain over the controls throughout the trial (Table 15.6). Although feed intakes were similar, calves fed Omniflavor were 8.5 and 6.9% more efficient at 28 and 56 days, respectively.

Processing the sorghum silages in these two trials did not significantly improve their nutritional values. Although cattle feeders often express concern about how effectively the sorghum grain is digested from whole-plant silages, the good performance by calves in these trials suggests that the grain was well utilized. Also, high DM intakes (except for the non-heading silage) and mild weather contributed to fast and efficient gains. Some compensatory gain may have occurred, since the pre-trial hay + grain rations were rather low in energy. But weighing procedures used should have prevented excessive fill from biasing the gains upward.

The grain and forage yields of the crops are shown in Table 15.1. Silage yields were not obtained in 1981. The two growing seasons were favorable in Manhattan and contributed to the high grain content in the whole-plant silages. Grain made up 31.4 and 47.9% of the silage dry matter in the forage and grain sorghum silages in 1982.

Relative feeding values for the whole-plant silages were compared by assigning a value of 100 to the grain sorghum silages, based on comparative rates and efficiencies of gain. Cornlage had a relative feeding value of 115 and this probably reflects its higher grain content. Forage sorghum silage had a feeding value of 78.5 in trial 1 and 94.0 in trial 2. A major contributing factor was a 20% lower feed intake. The non-heading sorghum silage had a feeding value of only 62.0, which was likely the result of its extremely low feed intake and very high moisture content. Calves fed the non-heading silage consumed 29 and 43% less DM than those fed forage and grain sorghum silages, respectively.

The feed flavor, Omniflavor, did not improve calf performance in trial 1 but did increase rates and efficiencies of gain in trial 2. In previous trials with feeder lambs, feed flavor supplements have consistently improved feed efficiency without affecting feed intake (Report of Progress 387, Kansas Agriculture Expt. Station). The slightly reduced intake of the Omniflavor rations in trial 1 may have been because the flavor was used at a higher average rate than in trial 2. Additional trials are needed to determine the effect of combinations of feed flavors and their use rates on performance of growing cattle fed silage-based rations.

Table 15.2. Overall Performance by Calves Fed the Three Whole-plant Silages, Averaged Across the Two Supplements (Trial 1)

Item	Whole-plant silage		
	Forage sorghum	Grain sorghum	Cornlage
No. of calves	32	32	16
Initial wt., lb	418	414	415
Final wt., lb	546	604	641
Avg. daily gain, lb	1.53 <sup>c</sup>	2.26 <sup>b</sup>	2.69 <sup>a</sup>
Avg. daily feed, lb <sup>1</sup>	11.68 <sup>c</sup>	15.43 <sup>b</sup>	16.63 <sup>a</sup>
Feed/lb of gain, lb <sup>1</sup>	7.66 <sup>b</sup>	6.84 <sup>a b</sup>	6.17 <sup>a</sup>
Relative feeding value <sup>2</sup>	78.5	100.0	115.0
Silage dry matter, %	34.0	36.3	54.2
Silage CP, %	7.4	9.3	8.4

<sup>a b c</sup>Values with different superscripts differ significantly (P .05).

<sup>1</sup>100% dry matter basis.

<sup>2</sup>Based on comparative rates and efficiencies of gain, with performance by calves fed grain sorghum silage given a value of 100.

Table 15.3. Overall Performance by Calves Fed the Four Sorghum Silage Rations, Averaged Across the Two Supplements (Trial 1)

Item	Forage sorghum silage		Grain sorghum silage	
	Whole	Processed	Whole	Processed
No. of calves	16	16	16	16
Initial wt., lb	418	418	412	416
Final wt., lb.	542	550	596	611
Avg. daily gain, lb	1.48 <sup>b</sup>	1.57 <sup>b</sup>	2.19 <sup>a</sup>	2.32 <sup>a</sup>
Avg. daily feed, lb <sup>1</sup>	11.61 <sup>b</sup>	11.72 <sup>b</sup>	15.11 <sup>a</sup>	15.75 <sup>a</sup>
Feed/lb of gain, lb <sup>1</sup>	7.83 <sup>b</sup>	7.48 <sup>b</sup>	6.88 <sup>a</sup>	6.80 <sup>a</sup>

<sup>a b c</sup>Values with different superscripts differ significantly ( $P < .05$ ).

<sup>1</sup>100% dry matter basis.

Table 15.4. Performance at 28, 56, and 84 Days by Calves Fed the Control an Omniflavor Supplements, Averaged Across the Five Silages (Trial 1)

Item	0 to 28 days		0 to 56 days		0 to 84 days	
	Control	Omniflavor	Control	Omniflavor	Control	Omniflavor
Avg. daily gain, lb	1.96	1.94	2.13	2.13	2.06	2.05
Avg. daily feed, lb <sup>2</sup>	12.15	12.03	13.37	13.15	14.35	13.98
Feed/lb of gain, lb <sup>2</sup>	6.29	6.30	6.35	6.28	7.10	6.97

<sup>1</sup>10 pens of four calves/pen were fed each supplement.

<sup>2</sup>100% dry matter basis.

Table 15.5. Performance by Calves Fed the Four Silage Rations, Averaged Across the two Supplements (Trial 2)

Item	S i l a g e			
	Non-heading	Forage sorghum	Grain sorghum whole	processed
No. of calves	16	16	16	16
Initial wt., lb	452	453	453	452
Final wt., lb	505	552	572	568
Avg. daily gain, lb	.95 <sup>c</sup>	1.77 <sup>b</sup>	2.12 <sup>a</sup>	2.07 <sup>a</sup>
Avg. daily feed, lb <sup>1</sup>	8.43 <sup>c</sup>	11.88 <sup>b</sup>	15.01 <sup>a</sup>	14.45 <sup>a</sup>
Feed/lb of gain, lb <sup>1</sup>	9.02 <sup>b</sup>	6.82 <sup>a</sup>	7.09 <sup>a</sup>	7.02 <sup>a</sup>
Relative feeding value <sup>2</sup>	62.0	94.0	100.0	100.0
Silage dry matter, %	22.0	30.7	35.9	
Silage CP, %	7.5	9.0	9.5	9.5

<sup>a b c</sup>Values with different superscripts differ significantly (P<.05).

<sup>1</sup>100% dry matter basis.

Based on comparative rates and efficiencies of gain, with performance by calves fed grain sorghum silage given a value of 100.

Table 15.6. Performance at 28 and 56 Days by Calves Fed the Control and Omniflavor Supplements, Averaged Across the Six Silages (Trial 2)<sup>1</sup>

Item	0 to 28 days		0 to 56 days	
	Control	Omniflavor	Control	Omniflavor
Initial wt., lb	453	453	453	453
28-day wt., lb	496.6	500.6	--	--
56-day wt., lb	--	--	542.3	548.8
Avg. daily gain, lb	1.56	1.70	1.60	1.71
Avg. daily feed, lb <sup>2</sup>	11.15	11.10	12.23	12.28
Feed/lb of gain, lb <sup>2</sup>	7.49	6.85	8.08	7.52

<sup>1</sup> 12 pens of four calves/pen were fed each supplement.  
100% dry matter basis.