1981

Twenty-fourth Annual Cattle Feeders Day

Animal Science Department
South Dakota State University

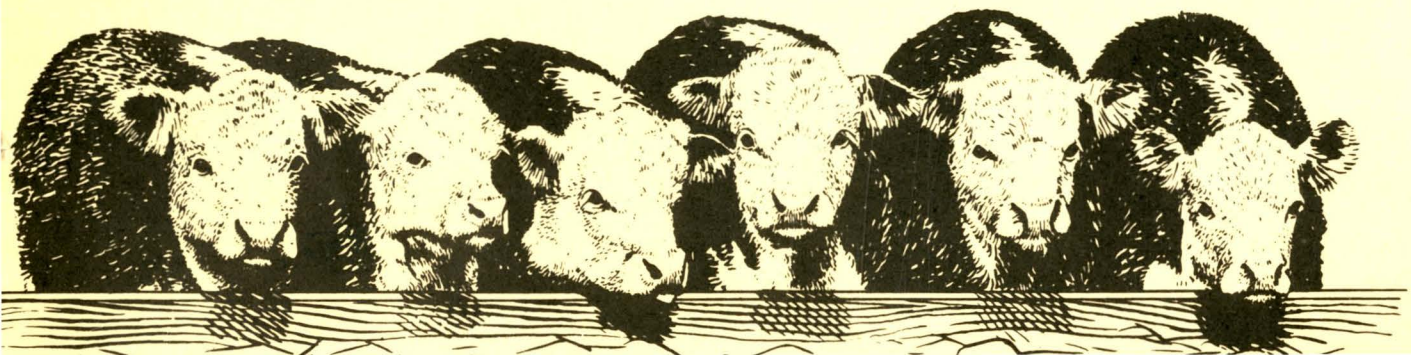
24th Annual

SDSU

CATTLE FEEDERS DAY

January 14, 1981
South Dakota State University
Brookings, SD

'DEDICATED TO THE CATTLE INDUSTRY'



24TH ANNUAL
CATTLE FEEDERS DAY

Wednesday, January 14, 1981
Animal Science Arena, SDSU

OPEN HOUSE
9:00-10:00 AM
Animal Science Complex and Research Facilities
Coffee

MORNING PROGRAM
10:00 AM-Noon
Ordell Rogen, President, South Dakota Livestock Association, Moderator

SCABIES RESEARCH WITH INJECTABLE IVERMECTIN -- Jim Bailey, Extension Veterinarian, SDSU

MEAT QUALITY AND FEEDLOT PERFORMANCE OF CROSSBRED BULLS, STEERS AND HEIFERS -- Dan Gee, Department of Animal Science, SDSU

LIVESTOCK RESEARCH NEEDS FOR THE 80's -- Joe Minyard, Head, Department of Animal Science

MARKETING ALTERNATIVES FOR CATTLEMEN -- Gene Murra, Extension Economist, SDSU

ACTIVITIES OF THE SOUTH DAKOTA LIVESTOCK ASSOCIATION -- Ordell Rogen

Barbecued Beef Lunch
Served by Block and Bridle Club, SDSU

AFTERNOON PROGRAM
1:00-3:30 PM
Jim Woster, Sioux Falls Stockyards, Moderator

FAMILY FARM PROFITABILITY -- Robert Woldt, South Dakota Director of Marketing

BASICS OF HEDGING CATTLE -- Jim Woster

LIVE CATTLE DEMONSTRATION - WHAT KINDS OF CATTLE ARE DELIVERABLE ON THE FUTURES MARKET? -- Switzer and Company, Sioux City Stockyards and Brookings County Livestock Association

Animal Science Department
Agricultural Experiment Station
Cooperative Extension Service
South Dakota State University
Brookings

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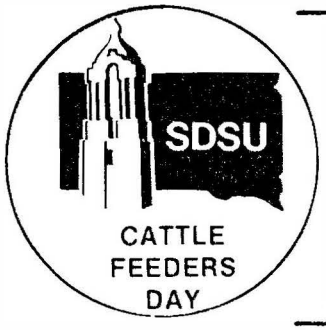


LASALOCID SODIUM SUPPLEMENTATION FOR GRAZING STEERS

L. B. Embry and M. J. Goetz
Department of Animal Science Report
CATTLE 81-1

Summary

Yearling steers grazing alfalfa-brome pastures and supplemented with 2 lb. daily of a pelleted corn supplement gained 1.69 lb. daily over a 146-day grazing period (May 29 to October 22, 1980). There was no improvement from supplementing with lasalocid sodium at 200 mg. daily. Lasalocid at 300 mg. or monensin (Rumensin) at 200 mg. daily resulted in similar daily gains with improvement of 9.6% over the control group.

Introduction

Lasalocid sodium (Bovatec) is a feed additive which has been reported to promote growth and improve feed utilization by cattle. The product appears to function by stimulating a more favorable and efficient microbial fermentation of the feed, thus improving rate and efficiency of production. Other research has also indicated the product to be an effective coccidiostat for cattle.

A previous experiment (CATTLE 80-10) with feedlot steers fed a high-grain ration resulted in 4.3% greater gains with 8.3% less feed (ADG, 3.23 lb. with 7.63 lb. feed per lb. gain for the control group). In the experiment reported here, lasalocid was tested for its effects on weight gain of grazing steers. The product was fed at two levels and compared to a nonmedicated control and to monensin (Rumensin).

Procedures

The experiment was conducted using 64 steers (48 Hereford and 16 Hereford-Angus). They were allotted to 16 pasture paddocks of 4 steers each on basis of weight and breed group. Initial weights were following an overnight stand without feed and water (about 16 hours) and about 20 hours without feed and water for the final shrunk weights. Intermediate weights during the pasture season were without shrinking the steers.

The steers were implanted with 36 mg. Ralgro at the beginning of the experiment. They were given an injection of Clostri-Bac-4 (clostridium chauvoei, septicum, novyi and sordelli).

Experimental treatments, each replicated four times, and dosage level of test products were as follows:

1. Corn grain (control)
2. Corn grain with 200 mg. lasalocid per head daily
3. Corn grain with 300 mg. lasalocid per head daily
4. Corn grain with 200 mg. monensin per head daily.

The corn grain supplement was used as the carrier for the appropriate levels of the test products. It was pelleted and hand fed daily at 2 lb. per head in feed bunks for each paddock. Trace mineral salt and dicalcium phosphate were provided separately on a free-access basis.

The pastures were alfalfa-brome mixtures with a stand of about 50% alfalfa. Each paddock for the four steers was 3.9 acres. The paddocks were grazed continuously with the same four steers during the 146-day experiment (May 29 to October 22, 1980).

Results

Results of the experiment are shown in table 1. A mechanical problem with the pelleting mill resulted in a delay of 1 week in feeding of the supplemental feeds. Heavy rains made it necessary to omit 2 days of supplementation near the end of the first month on pasture. Otherwise, the supplements were fed 2 lb. per head daily during the experiment.

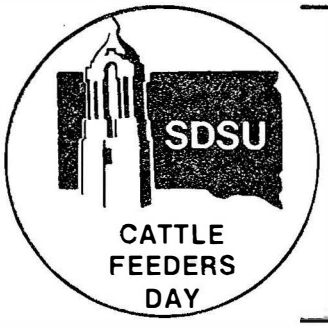
Two steers had to be removed from the experiment because of urinary calculi. One was in the control group and the other one was from the monensin treatment. Data for these two treatments are for 15 steers. However, a steer similar in weight replaced each steer to equalize growing pressure in each paddock.

The average daily gain of 1.69 lb. daily over the 146-day experiment represents good performance for the pasture and 2 lb. daily of a corn grain supplement. No improvement was obtained from lasalocid at 200 mg. daily. Steers supplemented with 300 mg. of lasalocid or 200 mg. monensin daily gained at the same daily rate (1.83 lb.). The improvement over controls amounted to 9.6%.

Supplement and pasture days per unit of gain are reflections of differences in weight gain since they were constant among treatment groups.

Table 1. Pasture Performance of Steers
(May 29 to October 22, 1980--146 days)

Treatment	Control	200 mg. lasalocid	300 mg. lasalocid	200 mg. monensin
No. of animals	15	16	16	15
Init. shrunk wt., lb.	564	571	569	574
Final shrunk wt., lb.	790	789	815	817
Avg. daily gain, lb.	1.69	1.67	1.83	1.83
Avg. daily supplement, lb.	1.85	1.85	1.85	1.85
Feed/100 lb. gain				
Pasture days	70	60	55	54
Supplement	118	111	101	101



IMPLANTING SITE FOR ZERANOL COMPARED TO SYNOVEX-S FOR FINISHING STEERS

L. B. Embry, M. J. Goetz and R. W. Rosenboom
Department of Animal Science Report
CATTLE 81-2

Summary

Zeranol (Ralgro) implants at the recommended and shallow site between the skin and cartilage of the ear and at an alternate and deep site at base of the ear were compared to Synovex-S and nonimplanted controls in two experiments. Ralgro at each implanting site and Synovex improved weight gain and feed efficiency in each experiment. The average improvement over nonimplanted controls in weight gain for the two experiments was 8.3, 11.1 and 12.0%, respectively, for the zeranol at the recommended and shallow site, zeranol at the alternate and deep site and Synovex-S. Average improvements in feed efficiency over controls for the three implant treatments in order listed above were 7.1, 4.8 and 5.6%. There appeared to be no important differences between implant treatments in carcass characteristics of the steers.

Zeranol at the alternate and deep site appeared to give results similar to Synovex-S. While any apparent advantage over the usual recommended site of implanting for zeranol was small, implanting deep at the base of the ear is easier, faster and likely to be a more uniform method between animals.

Introduction

Numerous experiments during the past several years have shown that ear implants of diethylstilbestrol (DES and DES also as a feed additive), Synovex or zeranol (Ralgro) improve weight gain and feed efficiency of growing and finishing steers and heifers. The improvement has been reported from an early age throughout growing and finishing by reimplanting of the products at appropriate intervals. Improvement has been reported with numerous types of rations, but the degree of response may vary with the nutritional adequacy.

DES has been more widely used because of the greater amount of information on the product and lower cost in comparison to Synovex and zeranol. Since the banning of DES, there has been more interest in the response that might be expected from Synovex and zeranol. Implanting technique has also received considerable emphasis as to the effects on degree and uniformity of response from implants.

We have completed two experiments with finishing steers where responses to Synovex-S and zeranol were compared to nonimplanted controls. Two implanting sites were used for zeranol in each experiment.

Procedures

Experiment 1

This experiment was initiated on July 18, 1979, with 72 steers of Hereford, Hereford-Angus or Limousin crossbreds. They were allotted into 12 pens of six each on basis of weight and breed group (four Hereford, one Hereford-Angus and one Limousin per pen). Implant treatments were as follows:

1. Nonimplanted control
2. Synovex-S
   200 mg. progesterone and 20 mg. estradiol benzoate
3. Zeranol (Ralgro)
   36 mg. implanted at recommended location--shallow between skin and cartilage of ear about 1 inch from base of the ear for the inner edge of implants
4. Zeranol (Ralgro)
   36 mg. implanted at alternate site--deep and at base of ear.

The steers were fed a ration of 5 lb. corn grain and a full feed of oat hay for 6 weeks before being put on the experiment. After allotting and sorting for the experiment, they were implanted according to the experimental treatments. They were injected with clostridium chauvoei-septicum-novyi-sordelli bacterin and given a Warbex pour-on treatment.

The experimental rations (dry basis) were 85% whole corn grain, 10% alfalfa as haylage and 5% supplement. The supplement was a corn-soybean base with minerals, vitamin A and monensin. It was formulated to contain 20% protein, 4% calcium, 6% potassium and 6% trace mineral salt. Vitamin A was added at 30,000 I.U. and monensin at 300 mg. per pound of supplement.

Corn stored as high-moisture grain at harvest from the 1979 crop, dry corn reconstituted to high moisture or dry corn was fed to one of the three pens of cattle from each implant treatment group. The proportions of grain, haylage and supplement on a dry basis were converted to proportions as fed for each type of corn. Rations were batch mixed on these bases for each pen and fed once daily in amounts to be nearly consumed by the next feeding. A 10-day period was used to get on full feed of the high-grain rations.

The experiment was terminated on November 26 after 131 days. The cattle were marketed through a local packing plant and carcass data were obtained.

Experiment 2

This experiment was initiated on December 5, 1979, with 120 steers. They were allotted to 12 pens of 10 each on the basis of weight and breed group (eight Angus, one Hereford and one Hereford-Angus per pen). Experimental treatments and rations were as for experiment 1. Feeding and management were also essentially as for experiment 1.

This experiment was terminated on March 18, 1980, after 104 days. The cattle were marketed and carcass data obtained as for experiment 1.

Results

The experiments were to be conducted as replications over time. In view of the differences in time of year conducted, length of experiments and number of cattle, results are presented separately for each experiment. In order to eliminate the influence of manure carried by the cattle on the apparent weight gain, final weights were adjusted on basis of carcass weight and a yield of 62%. The cattle in each experiment graded about low choice and this yield was considered to be an appropriate one. The performance on basis of carcass weight was considered to more accurately represent animal performance, especially for experiment 2 terminated in March.

Experiment 1

Results for experiment 1 are shown in table 1. Each implant treatment resulted in an increase in weight gain. Improvements over the control group amounted to 9.9, 14.8 and 13.0%, respectively, for zeranol at the recommended and shallow site, zeranol at the alternate and deep site and Synovex-S.

Implant treatments increased feed consumption. The increase was more than the increase in rate of gain, resulting in less improvement in feed efficiency than for weight gain. Improvement in feed efficiency in comparison to the control group amounted to 4.2, 5.0 and 2.9 for treatments in the same order as given for weight gain above.

There were no important differences in the carcass characteristics measured. Differences in carcass weights would be expected to affect some of the characteristics shown. However, there are some inconsistencies indicated and probably represent usual variation for the number of animals involved.

Experiment 2

Results of experiment 2 are shown in table 2. Weight gain was also improved in this experiment from the implant treatments. The improvement was less than for experiment 1 and amounted to 6.7, 7.5 and 11.0%, respectively, over the control group for zeranol at the shallow and recommended site, zeranol at the deep and alternate site and Synovex-S. Feed efficiency was improved by 10.0, 4.6 and 8.4%, respectively, over the control group for the three implant treatments.

Carcass characteristics shown in the table varied only slightly and less than in experiment 1.

Table 1. Ralgro and Synovex-S Implants for Feedlot Steers
(Experiment 1 - July 18 to November 26, 1979 - 131 Days)

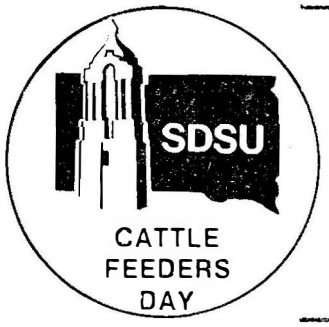
Treatment	Control	Zeranol (recommended shallow site)	Zeranol (alternate deep site)	Synovex-S
No. of animals	18	18	18	18
Init. shrunk wt., lb.	759	747	760	754
Final wt., lb.[a]	1132	1155	1186	1174
Avg. daily gain, lb.	2.84	3.12	3.26	3.21
Avg. daily ration (dry), lb.	19.82	20.84	21.52	21.69
Feed/100 lb. gain (dry), lb.	697	668	662	677
Hot carcass wt., lb.	701	716	736	727
Marbling[b]	5.00	5.33	5.67	5.00
Maturity[c]	23.7	23.3	23.3	23.0
Carcass quality grade[d]	19.0	19.3	19.3	18.3
KHP fat, %	2.03	1.80	1.73	1.90
Rib eye area, sq. in.	12.40	11.74	11.96	12.54
Fat thickness, in.	.56	.68	.60	.66

[a] Final weight based on carcass weight and a carcass yield of 62%.
[b] Marbling scores: 5 = small amount; 6 = modest amount.
[c] Maturity scores: 23 = A maturity; 24 = A- maturity.
[d] Carcass grade scores: 18 = Good +; 19 = Choice -; 20 = Choice.

Table 2. Ralgro and Synovex-S Implants for Feedlot Steers
(Experiment 2 - December 5, 1979, to March 18, 1980 - 104 Days)

Treatment	Control	Zeranol (recommended shallow site)	Zeranol (alternate deep site)	Synovex-S
No. of animals	30	30	30	30
Init. shrunk wt., lb.	785	778	789	785
Final wt., lb.[a]	1050	1061	1074	1079
Avg. daily gain, lb.	2.55	2.72	2.74	2.83
Avg. daily ration (dry), lb.	19.94	19.15	30.44	20.27
Feed/100 lb. gain (dry), lb.	782	704	746	716
Hot carcass wt., lb.	651	658	666	669
Marbling[b]	5.0	5.1	5.0	5.4
Maturity[c]	23.2	23.1	23.3	23.3
Carcass quality grade[d]	18.8	18.8	18.8	19.3
KHP fat, %	2.1	2.0	1.9	1.9
Rib eye area, sq. in.	11.12	11.49	11.84	11.70
Fat thickness, in.	.51	.51	.48	.46

[a] Final weight based on carcass weight and a carcass yield of 62%.
[b] Marbling scores: 5 = small amount; 6 = modest amount.
[c] Maturity scores: 23 = A maturity; 24 = A- maturity.
[d] Carcass grade scores: 18 = Good +; 19 = Choice -; 20 = Choice.



EFFECT OF A BACTERIAL SILAGE INOCULANT ON QUALITY, PRESERVATION AND UTILIZATION OF CORN SILAGE BY BEEF STEERS

R. Drake, R. M. Luther and L. D. Kamstra
Department of Animal Science Report
CATTLE 81-3

Summary

Corn forage harvested from the 1979 corn crop was ensiled in two experimental concrete silos. Moisture content of the forage was 62%. One silo (untreated) was filled with 3680 lb. of forage and the other was filled with 3628 lb. of forage inoculated with a Lactobacillus acidophilus fermentation product applied at a rate of 1 lb. per ton of wet forage. Silage fermentation was monitored by collecting samples through sampling ports in the silos over a 27-day period. Heat of fermentation was determined by temperature probes within the silos. Temperatures were higher in untreated than in treated silage during the fermentation period. Peak temperature (91 F) for treated silage was recorded 2 to 3 days earlier than untreated silage which peaked at 95 F. Chemical profiles were obtained on samples collected at ensiling, during fermentation and as the silage was removed for feeding.

Lactic acid formation was generally higher for treated than for untreated silage throughout the fermentation period. Highest concentrations of lactic acid were observed in untreated silage 4 days later than in treated silage. Organic acid (acetic and propionic) concentrations were also higher in treated silage. Butyric acid was detected at very low concentrations in either silage. Ammonia nitrogen levels were lower in treated silage. Differences in chemical profiles between untreated and treated silage were less evident as the silage was removed from the silo for feeding. Lactic and total volatile fatty acids were only slightly higher in the treated silage. Recovery of dry matter was 82.9% for untreated silage and 84.2% for treated silage. Digestibility of dry matter, crude protein and organic matter by beef steers was similar for the two silages. Nitrogen retention was only slightly lower for the treated silage. Results of these studies show that treatment of corn forage with a microbial silage inoculant improved the fermentative characteristics of the silage. Benefits of lower heat production and increased organic acid concentration observed throughout the fermentation did not appear to carry through to the silage as it was removed and fed to beef steers. Problems of moisture entering the silos appear to be related to the disparity in fermentation characteristics and the quality of silage removed from the silo.

Introduction

The making of quality silage is largely dependent upon the fermentation process that takes place in the forage after ensiling. It is generally believed that the number and type of microorganisms present in the ensiled forage is sufficient to initiate fermentation, especially in corn forage, a favorable material for ensiling. However, research has shown that microbial numbers can vary widely even in corn forage. Low microbial populations appear to slow the rate and extent of fermentation. The conditions which

contribute to low microbial numbers are not known. Inoculation of forage with desirable bacteria offers a means of providing additional bacteria to initiate rapid fermentation and to allow it to proceed at a faster rate with reduced heat production. The expected result would be to improve preservation of nutrients and produce higher quality silage.

The objectives of this study were to determine the effect of treating corn forage with a microbial silage inoculant (Lactobacillus acidophilus fermentation product[1]. Response to inoculation was compared with untreated forage in terms of chemical fermentation characteristics, preservation of dry matter and digestibility by beef steers.

Procedures

Corn forage from the 1979 corn crop was harvested with a conventional forage chopper. The yield of corn grain was 108 bushels per acre (15% moisture). The chopped forage was weighed into a feed mixing wagon[2] equipped with a scale and allowed to mix for about 10 minutes. The forage was transferred to two concrete experimental silos used for silage preparation. One silo was filled with untreated forage. The other silo was filled with forage inoculated with Lactobacillus acidophilus at a rate of 1 lb. of product per ton of wet forage.

The silo structures were reinforced concrete culverts 6 feet high, 5 feet inside diameter with a 4-inch wall. Each silo was equipped with a 14-inch door opening the height of the silo and six sampling ports. The sampling ports were 1 and 1 1/2 inches in diameter, situated in the silo wall 3 feet above the bottom and spaced at 60^{o} angles. The silos were placed on a concrete slab equipped with a "U" shaped trough for collection of seepage liquids. Packing was accomplished by two persons walking on the surface of the silage during filling. The silos were covered with a plastic cover and a wooden lid placed on the plastic such that the lid fit inside the silo. Cement blocks were placed on the lid to provide 1200 lb. weight. An indoor-outdoor thermometer was installed through one sampling port with a sensor located in the center of the silo. Temperatures of the silage were recorded at noon and at 5 p.m. daily for about 1 month after ensiling.

Samples were collected during ensiling, twice weekly through the ports during the fermentation period of 27 days and as the silage was removed from the silo. The material was placed in double plastic bags, closed with a fastener and immediately frozen for later chemical analysis.

A chemical silage quality profile was completed in the laboratory on all samples. Moisture was determined by drying a 100-gram quantity in a forced air oven at 70 C for 24 hours and also by a toluene distillation method. Other characteristics of the profile determined were pH, titratable acidity, total nitrogen, ammonia nitrogen, organic acids (acetic, propionic, butyric), lactic acid and inorganic ash.

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[1] Sila-Bac Silage Inoculant, Pioneer Hi-Bred International.
[2] Blair Manufacturing Company, Blair, Nebraska.

Preservation of nutrients was determined on the basis of dry matter ensiled and removed from the silo. Spoiled silage was separated from the good silage, weighed and sampled as the silos were being emptied.

Utilization of nutrients from untreated and treated silage was determined in a digestion-nitrogen balance trial with beef steers. Twelve steers averaging 628 lb. were placed in individual pens at the Animal Science Complex. The pens were equipped with automatic waterers and were situated over a concrete slatted floor. The steers were fed corn silage produced locally for about 2 weeks. The steers were then weighed and allotted to the two silage treatments with six steers per treatment. The experimental silages were full-fed for an additional week and the steers were placed in metabolism crates. A supplement consisting of soybean meal, 91.18%; dicalcium phosphate, 6.08% and trace mineral salt, 2.73% was fed to each steer at a rate of 1.65 lb. per day. Vitamin A was added to the supplement to provide 15,700 I.U. of vitamin A daily. The steers were allowed to adjust to the metabolism crates and a 5-day total collection digestion-nitrogen balance trial was conducted. The steers were fed silage twice daily and refusals were weighed the following morning. Urine and feces were collected once daily, measured or weighed and a 10% aliquot saved for chemical analysis. The fecal material was dried in a forced air oven at 70 C for 36 hours. Measures of utilization included digestible dry matter, crude protein, organic matter and nitrogen retention.

Results

Silage Fermentation Characteristics

Heat production for untreated and treated silage is indicated by the temperature curves presented in figure 1. The temperatures of the forage following ensiling were 68 F and increased rapidly the first week after ensiling. The highest temperatures observed for untreated and treated silage were 95 and 91 F, respectively, with the treated silage reaching a peak 2 to 3 days earlier than untreated silage. Temperatures were higher in untreated silage than in treated silage throughout the fermentation period.

Lactic acid formation was greater in treated silage than in untreated silage as shown in figure 2. Concentrations of the acid increased rapidly early in the fermentation of treated silage. In the untreated silage, lactic acid formation appeared to be slowed for about 6 days after ensiling but then increased rapidly to 10 days. Peak lactic acid production was observed at 13 days following ensiling with the treated silage and at 17 days with the untreated silage. Formation of lactic acid tended to decline thereafter in both silages. Variation in acid formation during the fermentation period appeared to be caused by collecting the fermented samples from sampling ports located at different positions in the silo.

Formation of total volatile fatty acids was higher in inoculated silage than in untreated silage as shown in figure 3. Acetic acid, a major component of volatile fatty acids in silage, accounted for 2.95% of the dry matter in treated silage when acid production was at its peak. This compares with 4.13% in untreated silage at peak acid production (14 days after ensiling). Propionic acid comprised a smaller proportion of the fatty acids and was generally higher in treated than in untreated silage. Butyric acid, an indicator of improper fermentation, was present at very low concentrations in either silage.

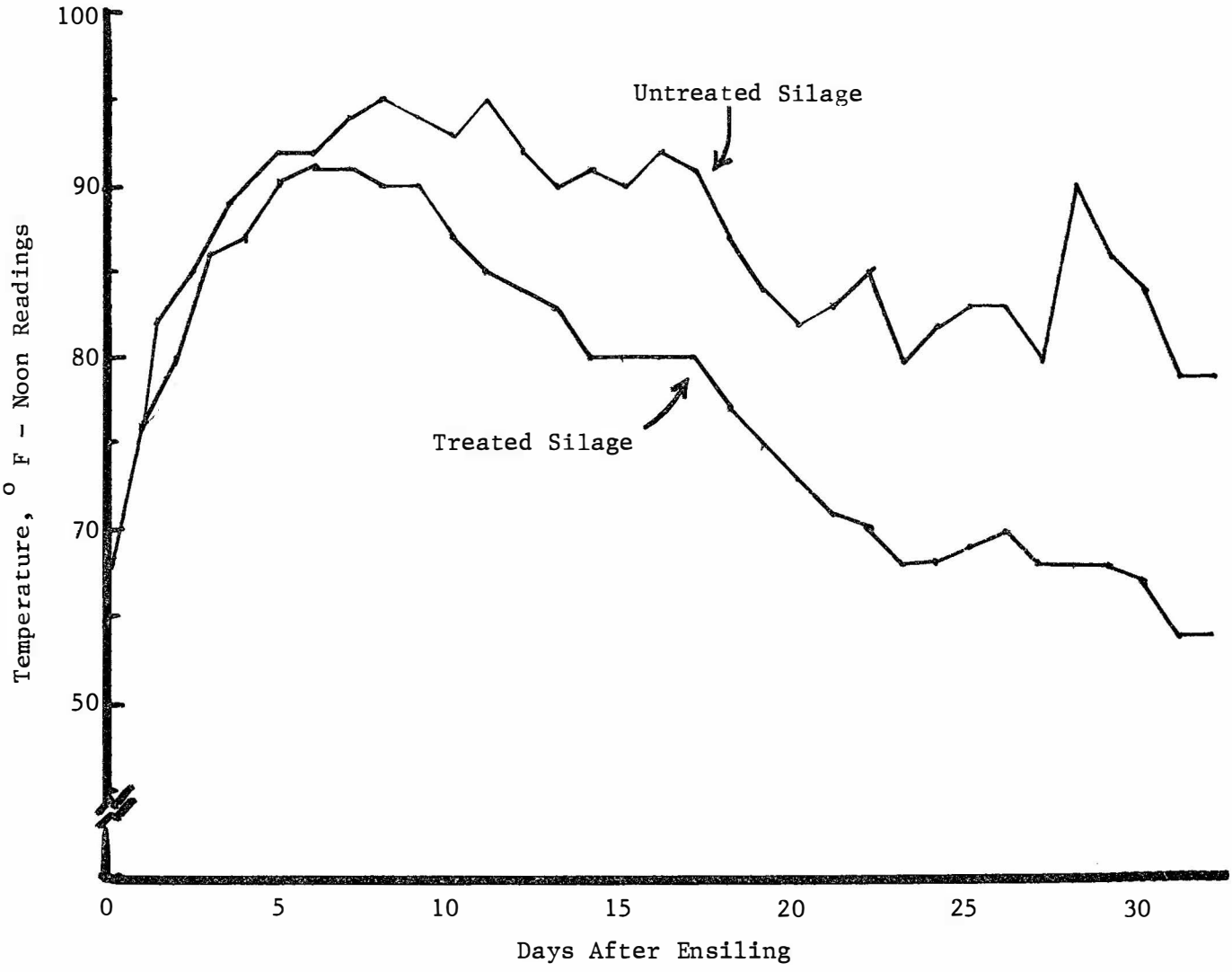


Figure 1. Fermentation Temperatures for Untreated and Treated Corn Silage.

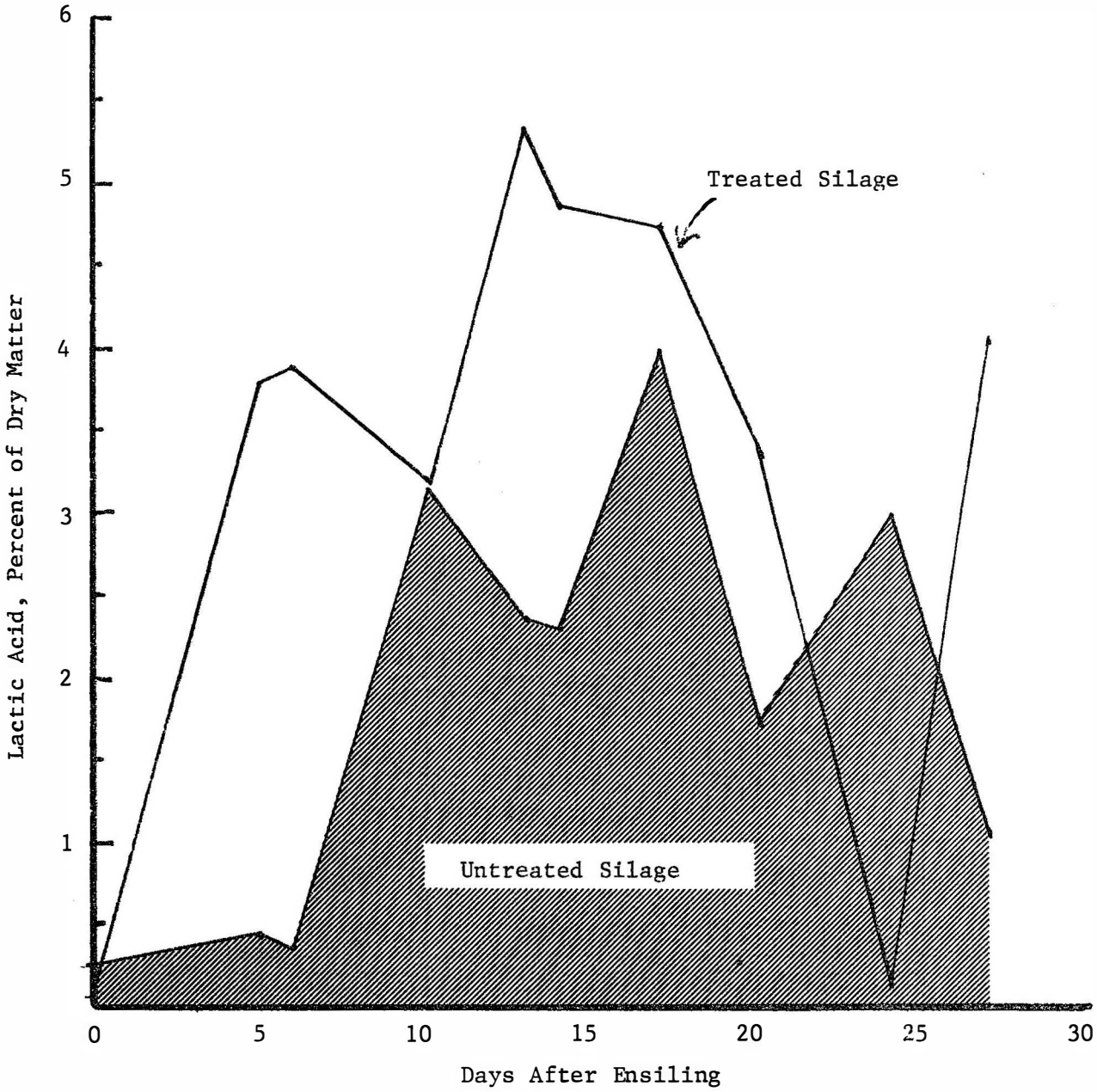


Figure 2. Lactic Acid in Untreated and Treated Corn Silage.

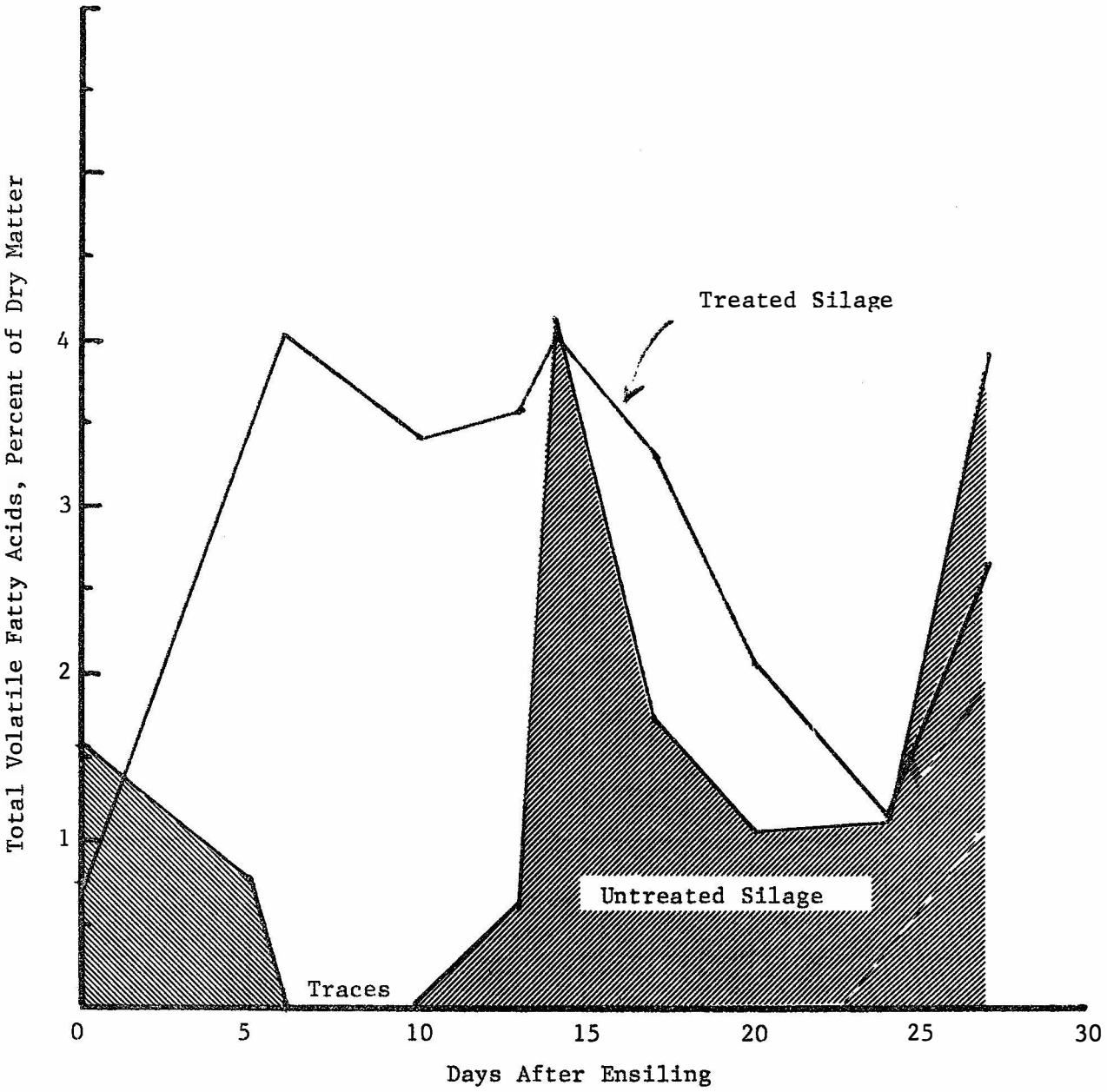


Figure 3. Total Volatile Fatty Acid Content of Untreated and Treated Corn Silage.

Measurements of titratable acidity coincided with organic acid production. Differences in pH were small and tended to parallel titratable acidity and organic acid concentrations. There appeared to be no appreciable reduction in crude protein content in either of the silages during the fermentation period. However, ammonia nitrogen was consistently lower for the treated silage, possibly indicating protein destruction in the untreated silage.

Silage Quality and Preservation

The chemical profiles of corn forage ensiled and those of silage removed from the silo for feeding are presented in table 1. The silo which contained the untreated silage was filled about 2 hours prior to filling of the silo used for treated silage. The forage from both silos was harvested as one load about 3 hours prior to filling the first silo. Therefore, chemical changes in the forage could have occurred in this 5-hour period but were likely to have been minimal. Results of chemical analyses show the formation of small concentrations of lactic and other organic acids. This would indicate that fermentation had been initiated prior to or during the ensiling process. There were only small differences, however, between forage placed in the first silo (untreated) and that place in the second silo (microbial treated).

Table 1. Chemical Profiles of Corn Forage and Silage for Feeding as Affected by Bacterial Inoculation[a]

	Ensiled corn forage		Silage for feeding	
	Untreated	Treated	Untreated	Treated
Dry matter, %[b]	38.81	38.14	36.86	35.17
pH	5.79	5.80	4.38	4.61
Titratable acidity[c]	1.35	1.46	6.42	8.27
Percent of dry matter				
Ash	5.04	5.39	4.84	5.53
Crude protein	7.58	7.50	8.79	8.39
Ammonia nitrogen[d]	.26	.26	.66	.64
Lactic acid	.06	.08	3.15	3.59
Volatile fatty acids				
Acetic	0-T[e]	0-T	.95	1.35
Propionic	1.49	.71	.57	.68
Butyric	.08	.04	.13	.01
Total	1.57	.75	1.65	2.04
Acid-detergent fiber	27.12	26.67	28.50	26.47
Acid-detergent lignin	3.58	3.76	4.21	3.73

[a] Inoculated with Lactobacillus acidophilus fermentation product at rate of 1 lb. per ton of forage.
[b] Toluene distillation.
[c] Milliliters of .1N KOH to raise pH to 7.
[d] Percent of crude protein.
[e] T = trace.

Silage for feeding was removed from the silo in January of 1980, starting 96 days after ensiling. Titratable acidity, lactic and volatile fatty acids were higher in treated silage than in untreated silage. Differences between the two silages, however, were not as prominent as those observed during the fermentation period. Inoculated silage also had a higher moisture content and somewhat less acid-detergent fiber than untreated silage.

Table 2 shows the recovery and losses of dry matter in untreated and treated silage. The moisture content was slightly higher for forage that was inoculated with microorganisms, resulting in fewer pounds of total dry matter ensiled for this treatment. Dry matter recovered as silage for feeding from the treated silage was 84.2% of the dry matter ensiled compared to 82.9% for the untreated silage. Spoilage losses and nonrecoverable losses amounted to 17.0% for untreated silage and 15.8% for treated silage.

Table 2. Dry Matter Recovery of Corn Silage as Affected by a Microbial Silage Inoculant[a]

	Untreated	Treated
Dry matter of corn forage, %	38.83	38.14
Total dry matter ensiled, lb.	1428.6	1383.7
Total dry matter of feed silage, lb.	1184.8	1164.7
As a percent of dry matter ensiled, %	82.94	84.17
Dry matter losses		
Spoilage, lb.	145.9	138.6
As a percent of dry matter ensiled, %	10.21	10.02
Nonrecovered, lb.	97.9	80.4
As a percent of dry matter ensiled, %	6.85	5.81

[a] *Lactobacillus acidophilus* fermentation product applied at 1 lb. per ton of forage.

Silage Utilization

Results of digestion and nitrogen balance studies with beef steers fed the untreated and treated silage are presented in table 3. The silage used in these studies was the material upon which quality and preservation measurements (tables 1 and 2) were obtained. Data from the digestion experiment indicate only small differences between the two silage treatments with respect to the digestibility of dry matter, crude protein and organic matter. The retention of nitrogen (grams/steer/day) was slightly lower for steers fed the treated silage as compared to those fed the untreated silage. Retention

Table 3. Digestibility and Nitrogen Retention With Beef Steers Fed Untreated and Microbial Inoculated Corn Silage

	Untreated	Treated[a]
Number of steers	6	6
Average weight, lb.	628	627
Avg. daily dry matter intake, lb.	12.19	12.36
Avg. daily nitrogen intake, lb.	.26	.25
Digestibility, %		
Dry matter	69.45	68.83
Crude protein	68.06	67.72
Organic matter	71.17	70.65
Nitrogen balance, grams/day		
Fecal	37.2	36.8
Urinary	43.2	44.4
Retained	35.8	32.7
Percent retained of consumed	30.6	28.4

[a] Inoculated with Lactobacillus acidophilus fermentation product at rate of 1 lb. per ton of forage.

of nitrogen based upon nitrogen consumed amounted to 30.6% for steers fed the untreated silage and 28.4% for steers fed the treated silage.

Discussion and Comments

The experimental silos used in these studies were useful in monitoring chemical changes occurring in the silage during fermentation. The quantity of silage produced was adequate to evaluate the treatments in a short-term feeding experiment with smaller numbers of beef cattle. Chemical profiles obtained during this study indicated that silage quality was within the range of that observed with silage produced in larger storage structures.

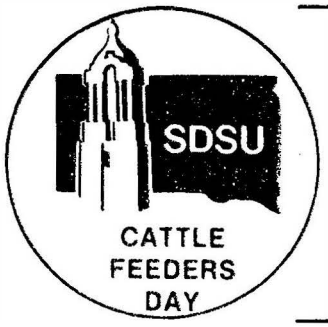
A problem was encountered during the experiment with moisture, from rain, penetrating the plastic silo cover. A hard rain was experienced about 30 days after ensiling causing water to move into the silo. An amber-colored liquid filled the seepage containers with substantial overflow. The volume of runoff liquid was not measured. However, runoff appeared to be greater for the silo containing the treated silage. Analysis of the runoff showed that it contained rather high concentrations of organic acids, indicating the loss of acidity produced during fermentation.

This might possibly explain the lower concentrations of lactic and volatile fatty acids observed in the silages used for feeding compared to silages taken at the end of the fermentation period. Losses of soluble

nitrogen and carbohydrates may also have occurred in the runoff. These losses might be expected to narrow the differences between the silages as was shown in the digestion-nitrogen balance study with cattle.

Silage quality was improved by microbial inoculation of corn forage as indicated by chemical profiles obtained during and at the end of the fermentation period. This improvement was not as pronounced when the silage was removed from the silo. Differences in utilization by beef cattle likewise did not parallel chemical changes that favored the silage inoculated with microorganisms.

Prepared for Cattle Feeders Day, Brookings, South Dakota, January 14, 1981.



CORN STOVER RESIDUE AND ALFALFA PRODUCTS FOR WINTERING BEEF STEERS

R. A. Drake, L. D. Kamstra and R. M. Luther
Department of Animal Science Report
CATTLE 81-4

Summary

Ground alfalfa hay, dehydrated alfalfa meal and pelleted alfalfa press-cake (a by-product of the leaf protein concentrate, Pro-Xan) were each fed with corn stover silage and ground corn stover. The stover was either chopped with a silage cutter or stacked with a Hesston stacker. The chopped stover was reconstituted with 11 cubic feet of water per ton and packed into a cement bunker silo. The Hesston stacks were ground as needed. A factorial feedlot experiment was conducted with beef cattle for 101 days to determine feed efficiency and average daily gain. Two total collection digestion-nitrogen balance trials were also conducted with beef cattle on the same rations. In the first digestion trial, all alfalfa supplements were fed with a stover silage based diet. The second trial utilized alfalfa supplements with a ground stover based diet.

Results of the feedlot trial showed that steers fed the alfalfa press-cake and dehydrated alfalfa supplemented ration had improved feed efficiencies and average daily gains over the steers fed the alfalfa hay rations. The dehydrated alfalfa resulted in the highest average daily gain, while the press-cake resulted in the lowest feed per pound of gain (highest efficiency).

Organic matter digestibility coincided with the dry matter intake in both digestion trials. Alfalfa hay had the highest digestible energy of all alfalfa supplements in the stover silage rations. No differences were noted in the ground stover rations. Crude protein digestibility was highest with the alfalfa hay ration followed in order by the dehydrated alfalfa and the alfalfa press-cake ration. The order was reversed, however, in terms of nitrogen retention. The alfalfa press-cake may have exhibited some rumen by-pass qualities which could explain the improved feed efficiency in the feedlot trial.

Introduction

It has been estimated that 2,850,000 acres of corn were harvested for grain in South Dakota during 1979. With the increased costs of corn production, it may become more necessary to utilize the entire plant. Corn stover grazing, a commonly used practice in the wintering of ruminants because of its convenience, is not an efficient method of utilizing the entire plant as two-thirds of the residue remains in the field. Necessary supplementation of corn stover is also difficult under grazing conditions.

Alfalfa hay, dehydrated alfalfa meal and alfalfa press-cake could be used as supplements to corn stover. Alfalfa press-cake is a by-product of Pro-Xan[1], a leaf protein concentrate extracted from green-chopped alfalfa. Pro-Xan contains the high protein and xanthophyll fraction desirable in poultry rations. According to Enochian[2], xanthophyll from Pro-Xan is utilized 1.7 times more efficiently in poultry rations than xanthophyll from dehydrated alfalfa. If the high fiber, press-cake by-product of the Pro-Xan process can be utilized in ruminants as efficiently as dehydrated alfalfa, the press-cake may be a suitable substitute for the dehydrated alfalfa. The objective of this study was to conduct a feeding trial where each of the alfalfa products was compared in rations containing stover silage and ground stover stacks for wintering beef cattle. These studies were then complimented with two digestion-nitrogen balance trials.

Procedure

Cornstalks were gathered into windrows in early November, 1979, with a 12 E Ford rotary scythe. The material was then either chopped with a silage cutter equipped with a forage head or stacked with a Model 3600 Hesston stacker. The chopped forage (approximately 1/2 inch diameter) was elevated into a 25 x 50 foot concrete bunker silo with water added during the delivery. Only 7 cubic feet of water per ton of chopped stover could be added during delivery. An oscillating garden sprinkler was placed on the pile at the end of the first and second day of filling. A total of 11 cubic feet of water per ton was added in the entire reconstitution process. To insure proper fermentation of the chopped stover, two tractors continuously stacked and packed. Twenty-one Hesston stacks were prepared at the same time and were ground as needed. Ground medium-bloom alfalfa hay, sun-cured dehydrated alfalfa meal (17% protein type) and pelleted alfalfa press-cake served as the corn stover supplements.

Seventy-two Angus x Hereford crossbred cattle were purchased for a 2 x 3 factorial feedlot experiment with two replications per treatment and six steers per replication. The steers averaged 570 lb. and were allotted to 12 pens. The animals were implanted with Ralgro and placed on the rations for a 2-week adaptation period (rations listed in table 1). All animals received trace mineral salt on a free-choice basis. Filled and shrunk weights were taken at the beginning and the end of the 101-day trial. Feed refusals and feed samples were collected periodically. Average daily gains and feed efficiencies were determined for all treatments.

Two digestion-nitrogen balance trials were also conducted with the feedlot rations (table 1). The first digestion trial utilized 12 Simmental x Hereford crossbred cattle. These steers averaged 660 lb. and were assigned four animals per alfalfa treatment with all animals receiving stover silage. The steers were allowed 3 weeks to adjust to the rations. They were then placed in the metabolism crates and allowed 4 days to adapt before the 5-day

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[1] Pro-Xan is a commercial product marketed by Valley Dehydrators, Sterling, Colorado.

[2] Enochian, R. V., G. O. Kohler, R. H. Edwards, D. D. Kuzmicky and C. J. Vosloh, Jr. 1980. Producing Pro-Xan (Leaf Protein Concentrate) from Alfalfa: Economics of an Emerging Technology. USDA, Ag Econ Report 445.

Table 1. Percentage Composition of Feedlot and Digestion Trial Rations on Dry Basis

Feedstuff	Percent of ration	Crude protein, %
Stover silage	48	2.0
Alfalfa hay	52	9.1
	100	11.1
Stover silage	54	2.3
Dehydrated alfalfa	46	8.8
	100	11.1
Stover silage	47	1.9
Alfalfa press-cake	53	9.1
	100	11.0
Ground stover	48	2.1
Alfalfa hay	52	9.1
	100	11.2
Ground stover	54	2.4
Dehydrated alfalfa	46	8.8
	100	11.2
Ground stover	47	2.0
Alfalfa press-cake	53	9.1
	100	11.1

collection began. The steers were fed twice daily with feed refusals taken in the morning. Urine and feces were collected daily with a 10% aliquot of each saved for chemical analysis. One steer refused to eat and had to be removed from the trial. The second trial was conducted with the same alfalfa supplements in the same manner except that all animals received the ground stover stacks in place of the stover silage. Another animal was added to the second trial to replace the previously removed steer. Dry matter, organic matter, crude protein, energy digestibilities and nitrogen retention were determined. Chemical analyses of total nitrogen, ash and total energy were determined on composites of the feed, orts, feces and urine samples using Association of Official Analytical Chemists procedures.

Results

Feeds Used in Feedlot and Digestion Trials

Table 2 shows the composition of stover coming out of the bunker silo and of the stover stacks taken at various times throughout the trial. The ground stover was higher in crude protein, ether extract, nitrogen-free extract and ash content. The ash content of the ground stover was over twice as high as the ash content of the stover silage. This was probably due to higher amounts of soil picked up in the grinding and feeding of the stover stacks. Crude fiber was higher in the stover silage than in ground stover. Two layers of

Table 2. Chemical Composition of Feeds on Dry Basis

Item	Stover silage	Ground stover	Alfalfa hay	Dehydrated alfalfa	Alfalfa press-cake
Dry matter	42.95	73.64	90.99	92.62	93.90
Crude protein	4.17	4.38	17.47	19.19	17.24
Crude fiber	40.18	32.89	36.81	21.38	24.29
Ether extract	.73	1.32	1.60	4.41	2.77
Ash	5.84	12.12	8.93	12.88	12.30
Nitrogen-free extract	49.08	49.29	35.19	39.07	43.40

mold coinciding with the levels at which the garden sprinkler was employed were also noted in the bunker silo. The moisture added by the garden sprinkler did not appear to penetrate very far into the chopped stover to aid in achieving the desired moisture content. However, moisture content of the reconstituted stover was adequate for fermentation to occur. The average moisture content of the stover silage coming out of the bunker was 57%. The fairly high initial moisture plus moisture absorbed from outside storage (26%) contributed to some spoilage in the stover stacks. The stover material from the stacks upon grinding tended to heat. This made it necessary to grind only a few stacks at a time to keep spoilage at a minimum. Spoilage also increased toward spring for both the stover silage and stacks. In comparing the alfalfa products as shown in table 2, it should be noted that the press-cake and the alfalfa hay had very similar protein values (17.24 and 17.47), while the dehydrated alfalfa was higher in protein (19.19). The press-cake had the highest nitrogen-free extract of the alfalfa supplements. The dehydrated alfalfa was higher in ether extract and lower in fiber content than the press-cake or alfalfa hay. The alfalfa hay was rather high in crude fiber and low in ash as compared to the other alfalfa supplements.

Feedlot Performance

Results of the feedlot study are listed in table 3. Average daily gain and feed efficiency were improved with steers fed the dehydrated alfalfa and the alfalfa press-cake rations over that for steers fed the alfalfa hay rations. The steers fed the dehydrated alfalfa rations exhibited improved average daily gain, especially with the ground stover. This was also true for feed efficiency with respect to the press-cake ration. Daily intake of steers was highest with the dehydrated alfalfa rations (average, 15.3 lb.) followed in order by alfalfa hay (average, 13.8 lb.) and press-cake (average, 13.7 lb.). Overall, the steers fed ground stover rations exhibited a slightly higher average daily gain and had higher feed requirements than the steers fed the stover silage rations.

Digestion Trials

Alfalfa hay with stover silage (table 4) exhibited the highest digestible dry matter, crude protein, energy and organic matter of the three alfalfa supplements. Conversely, the press-cake had the lowest digestibilities of the three supplements. The digestibilities coincided with dry matter intake.

Table 3. Feedlot Performance of Residue-fed Cattle
(March 14-June 23, 1980--101 Days)

	Alfalfa press-cake		Alfalfa hay		Dehydrated alfalfa		Average of all stover silage	Average of all ground stover
	Stover silage	Ground stover	Stover silage	Ground stover	Stover silage	Ground stover		
Number of animals	12	12	12	12	12	12	36	36
Initial shrunk wt., lb.	570	580	561	566	577	553	569	566
Final shrunk wt., lb.	650	670	632	625	660	659	647	651
Avg. daily intake (DM), lb.	13.0	14.4	13.0	14.6	13.7	16.8	13.2	15.3
Avg. daily gain (shrunk), lb.	.80	.89	.66	.60	.82	.95	.76	.81
Feed/lb. gain (shrunk), lb.	16.2	16.2	19.7	24.3	16.7	17.7	17.5	19.4

Table 4. Digestibility of Corn Stover Silage With Various Alfalfa Products in Steers--Trial 1

Item	Alfalfa hay	Dehydrated alfalfa	Press-cake
No. of animals	4	4	3
Avg. wt., lb.	660	658	662
DM intake, lb.	9.9	11.8	12.0
N intake, g.	86.7	101.0	93.5
Digestibility, %			
Dry matter	60.28	56.53	55.62
Crude protein	66.93	59.95	52.78
Energy	58.60	56.58	53.95
Organic matter	61.61	57.50	57.02
N retention			
Fecal N excreted	28.6	40.5	44.2
Urinary N excreted	42.1	41.1	30.5
Total N excreted	70.7	81.6	74.7
Percent N retained	18.6	19.3	20.0

In trial two (table 5) with ground stover, digestibility of crude protein was significantly lower for press-cake than for the other two supplements, even though dry matter intake was lower for steers fed press-cake. There were no differences in digestible dry matter, organic matter and energy between the alfalfa supplements. This suggests that the Pro-Xan fraction extracts the higher quality protein and perhaps more soluble proteins, leaving the less digestible proteins in the press-cake fraction. Crude protein as determined by Kjeldahl nitrogen analysis does not evaluate protein quality.

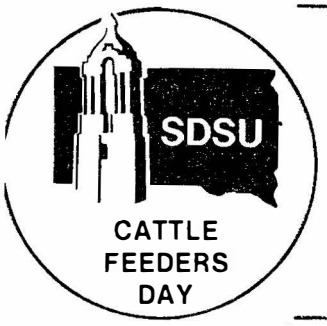
Crude protein digestibility was lower for the press-cake ration than for alfalfa hay or dehydrated alfalfa meal with either stover silage or ground stover. However, nitrogen retention was slightly higher for the press-cake product. The processes involved in the preparation of the press-cake may have rendered the protein less soluble, giving it the properties of a rumen bypass protein. Such protein, although less digestible, may be absorbed in the small intestine more efficiently than other alfalfa products which are subjected to microbial digestion in the rumen. This could explain why the press-cake rations gave similar average daily gains to the dehydrated alfalfa rations in the feedlot trial and were utilized more efficiently.

On the basis of steer performance on the various alfalfa supplements to corn stover, alfalfa press-cake appears to have potential as a protein supplement. Alfalfa press-cake would be a suitable substitute for dehydrated alfalfa on an equal basis if the costs of producing dehydrated alfalfa became prohibitive.

Table 5. Digestibility of Ground Stover Stacks With Various Alfalfa Products in Steers--Trial 2

Item	Alfalfa hay	Dehydrated alfalfa	Press-cake
No. of animals	4	4	4
Avg. wt., lb.	675	675	653[a]
DM intake, lb.	12.3	14.5	12.0
N intake, g.	121.7	146.3	99.6
Digestibility, %			
Dry matter	56.95	55.53	57.31
Crude protein	66.19	61.66	54.13
Energy	60.15	60.61	60.94
Organic matter	61.41	60.97	61.33
N retention			
Fecal N excreted, g.	41.1	56.2	45.7
Urinary N excreted, g.	56.5	58.0	30.5
Total N excreted, g.	97.6	114.2	76.2
Percent N retained	19.8	22.0	23.3

[a] One steer from first digestion trial replaced with a lighter steer.



OAT GRAIN RATIONS FOR GROWING AND FINISHING CATTLE

R. W. Rosenboom, L. B. Embry and R. M. Luther
Department of Animal Science Report
CATTLE 81-5

Summary

Feeding and digestion trials were conducted to determine performance of growing and finishing steers fed oats as the only grain in rations without added roughage. Oat grain was fed whole, rolled or ground and pelleted.

Similar weight gain was obtained when animals were fed whole and rolled grain. Steers fed rolled oats consumed less feed (1.1 lb. average daily). This lower feed consumption with about the same rate of gain resulted in lower feed requirements (5.1%) in comparison to whole oats.

Steers fed ground and pelleted oats gained at a faster rate (10.8%) than controls. They also consumed slightly less daily feed (.6 lb.) and had lower feed requirements (12.9%).

The digestion trial showed an improvement of 4.9% in digestibility of protein and organic matter for rolled oats over whole oats. Digestibility of rolled or ground and pelleted oats was similar.

Major problems with feeding oats without added roughage to cattle appear to be inadequate feed intake for high levels of production and those associated with digestive disorders. Whole oats appeared to present less of these problems than rolled or ground and pelleted oats. Comparisons were not made with other grains. However, gain was less and feed requirements were higher than typical for high-concentrate rations with corn grain.

Introduction

Oats are the world's fourth largest grain crop and South Dakota ranks first in oats production in the United States. Traditionally, oats have been used in limited amounts in rations for starting cattle on feed, wintering breeding flocks and herds, creep feeds and growing and backgrounding operations. The availability may make the grain a feasible alternative as a major feed grain if economic conditions are favorable.

Less supplemental protein is needed for cattle when feeding oats due to the higher protein content. The energy value is substantially lower than for corn grain primarily due to the high percentage of hulls. Light weight oats contain more hulls and, therefore, more fiber. This is why variation in the test weight may play a major role in feeding value. Oat grain has approximately the same fiber and energy contents as a ration with 60% shelled corn and 40% alfalfa hay. It is thus evident that oats must replace roughage as well as other grain in the ration or production will be reduced.

Processing methods such as rolling, grinding or pelleting are attempts to improve animal performance and utilization of a feedstuff. Reduction in particle size has been shown to affect rate of passage through the digestive tract and may improve digestibility. However, excessively fine grinding can result in digestive upsets that may decrease animal performance. Processing roughages has often been shown to improve gains and feed efficiency. Processing concentrates more often has resulted in improved efficiency only.

The poor animal performance obtained with rations containing a high amount of oats indicated a need to more accurately describe the place of oats in growing and finishing rations for cattle. Therefore, this experiment was conducted to study whole, rolled or ground and pelleted oats as the only grain for feedlot steers. Feedlot performance and digestibility were determined and compared for each form of oats.

Procedure

Feeding Trial

Ninety-six Hereford, Hereford-Angus and Limousin cross steers were used in a growing-finishing experiment. They were allotted into 12 pens of eight steers each on basis of weight and breed group (four Herefords, two Hereford-Angus and two Limousin crossbreds per pen).

Processing treatments for the animals included ear tagging, injecting with Clostridium chauvoei-septicum-novyi-sordelli bacterin, Warbex pour-on and a Tramisol injection.

Experimental treatments were oat grain fed whole, rolled to a fineness to essentially eliminate any whole kernels or finely ground and pelleted (3/16 inch). Oat grain was full fed with 2 lb. of a corn-base supplement which furnished minerals and vitamin A and monensin. The steers were adapted to the oat rations over a period of 10 days by gradual reduction in alfalfa-brome haylage and increases in oat grain. The cattle had been full fed the haylage without grain for about 6 weeks prior to the experiment. After increasing to a full feed, feeding was in amounts to be available at all times and offered once daily.

After several weeks on the experiment, implant treatments of zeranol and Synovex were superimposed upon replications of dietary treatments for the experiment. Results showed no response to implants under conditions of the experiment. Results, therefore, have been presented for oat grain treatments averaged for implant treatments.

Digestion Trial

Two digestion trials were conducted with the rations fed in the feeding trial. Collection periods were 5 days for each trial after suitable preliminary and adjustment periods for the experimental diets and conditions of the digestion trials.

Twelve steers weighing about 600 lb. were selected for each digestion trial with Angus used for one and Herefords for the other. Two steers could not be managed in the metabolism crates and one was not used because of poor feed consumption. Data for the two digestion trials were combined with 7, 6 and 8 steers fed whole, rolled and pelleted oat rations, respectively.

Results

Feeding Trial

Results of the feeding trial are shown in table 1. The experiment was terminated after 180 days. Feed consumption and weight gain at this time were considered unsatisfactory for the use of oat grain in all-concentrate finishing rations for cattle. Weight gain became progressively less with increasing weight, finish and time on experiment. Additional time on the experiment did not appear needed to evaluate effects of the processing methods on animal performance and feed utilization. The cattle were not marketed for carcass data because of inadequate weights and finish at this time.

Steers fed the ration with whole oats gained 1.85 lb. daily. The oats were high quality with a test weight of 39.1 lb. per bushel. Rolling the oats and reducing the density per bushel had essentially no effect on weight gain of the steers. Rolling the oats appeared to reduce feed consumption. Steers fed rolled oats consumed an average of 1.1 lb. less feed daily than those fed the whole oat ration. The lower feed consumption with about the same rate of gain gave lower feed requirements in comparison to whole oats (5.1%).

Table 1. Whole, Rolled or Ground and Pelleted Oats Fed Steers
Feedlot Performance
June 7 to December 4, 1979--180 Days

Item	Whole	Rolled	Ground and pelleted
Density of oats as fed to cattle, lb./bushel	39.1	26.4	45.6
Number of steers[a]	31	32	30
Avg. initial wt., lb.	640	636	634
Avg. final wt., lb.	968	964	1003
Avg. daily gain, lb.	1.85[bc]	1.83[b]	2.05[c]
Avg. daily feed (dry), lb.	16.9	15.8	16.3
Feed/gain	9.15[b]	8.68[bc]	7.97[c]

[a] Initially 32 steers per treatment group. The loss in the control was undiagnosed but not believed related to ration. The two in the pelleted group were from acidosis.

[b,c] Means in the same row with different superscripts are statistically different ($P<.05$).

Steers fed the ground and pelleted oats gained 2.05 lb. daily. This improvement over the whole oat group amounted to 10.8%. Feed intake was at a lower rate than for whole oats (.6 lb. daily). The higher gain with slightly less feed gave a feed requirement of 12.9% less than for whole oats.

The ground oats did not make a good firm pellet. Considerable crumbling occurred and it was estimated that about one-half of the oats offered was in a meal form.

Digestion Trial

Results for the two digestion trials are shown in table 2. Feed consumption was less under the conditions of the digestion trials than for the feeding trial. This is commonly observed because of the restraining of animals necessary. However, the average weight of the steers during the feeding trial was greater. As a percentage of average body weight, feed intake during the digestion trial was only slightly reduced.

Table 2. Apparent Digestibilities of Various Forms of Oats by Feedlot Steers (Composite of Two 5-Day Trials)

Item	Whole	Rolled	Ground and pelleted
DM consumed/steer/day, lb.	12.0	10.4	10.7
Digestion coefficients, %			
Dry matter	69.11	72.53	70.77
Crude protein	76.79[a]	80.59[ab]	80.97[b]
Organic matter	70.38	73.84	72.33

[a,b] Means in the same row with different superscripts are statistically different ($P<.05$).

Digestion coefficients were slightly higher for rolled and ground and pelleted oats than when fed whole. Values shown represent 4.9% greater digestion both for protein and organic matter for rolled oats over whole oats. There were smaller differences between ground and pelleted and the rolled oats.

EFFECTIVENESS OF COLD-FLO ANHYDROUS AMMONIA WITH FORAGE SORGHUM SILAGE[1]

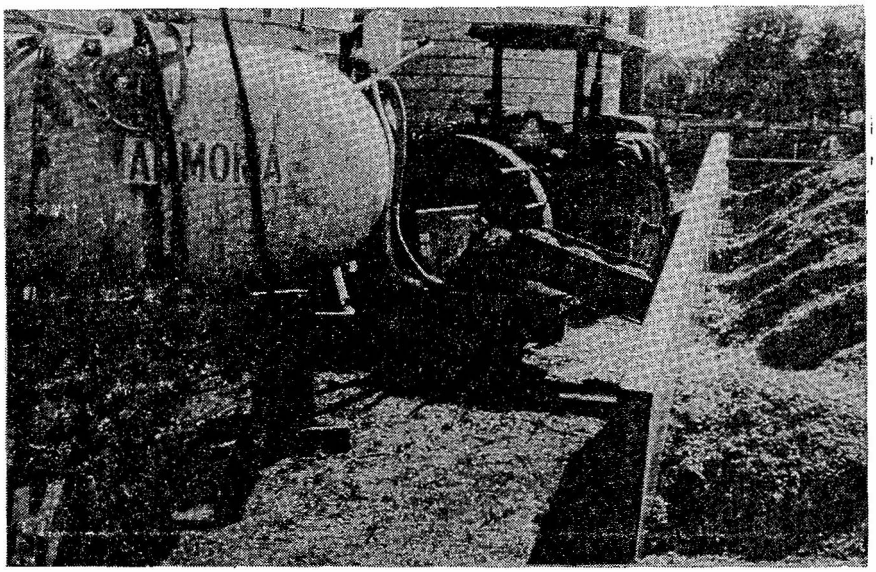
G. Kuhl, C. Carlson, G. Williamson and B. Jurgensen
Department of Animal Science Report
CATTLE 81-6

Summary

Forage sorghum was treated with Cold-Flo anhydrous ammonia at ensiling time and compared with untreated silage supplemented with soybean meal at feeding time. One hundred Angus steers were used in the 91-day trial.

Average daily gain of the cattle fed the two silages was very similar. However, cattle fed the ammonia-treated forage sorghum consumed less feed than controls, resulting in a substantially better (16.7%) feed conversion by steers on the ammonia-treated silage ration.

The results of this experiment indicate that Cold-Flo anhydrous ammonia is efficiently utilized as a nonprotein nitrogen source with forage sorghum silage. Further research is necessary with other low energy silages to confirm this original finding and expand the beneficial uses of this inexpensive silage additive for producers.



Anhydrous ammonia was applied to chopped forage sorghum using the Cold-Flo system.

[1] Trial conducted at the Southeast South Dakota Experiment Farm, Beresford, South Dakota.

Introduction

The application of liquid anhydrous ammonia to corn plant material has been demonstrated by several agricultural experiment stations to be a highly effective and economical means of increasing the crude protein content of corn silage.

In order to apply anhydrous ammonia as a liquid, a condensation chamber (Cold-Flo Converter) has been developed which converts pressurized gaseous ammonia to a super-cold liquid. This has the advantage of decreasing losses of the ammonia during application. This system has been patented by USS Agri-Chemicals and has received FDA approval for use with "freshly chopped corn plant material" as a source of nonprotein nitrogen However, research with other types of silages is lacking.

The objective of this study was to evaluate the feedlot performance of cattle fed Cold-Flo anhydrous ammonia-treated forage sorghum silage or untreated (control) silage supplemented with soybean meal at time of feeding. Since forage sorghum is lower in energy than corn silage, it was of great interest to determine whether ammonia would be efficiently utilized as a crude protein source with this type of silage.

Procedures

Late planted Pioneer 956 forage sorghum was harvested in late October, 1978, and ensiled in two 18 x 50 feet concrete air-tight silos. One silo was filled with untreated (control) silage, while the other had liquid anhydrous ammonia applied to the silage at the blower. An anhydrous ammonia field applicator equipped with a regulator supplied the ammonia. A Cold-Flo Converter was connected between the regulator and the forage intake of the blower.

Initially, several loads of chopped forage sorghum were weighed and their unloading times measured. From this information, the average unloading rate was calculated, and the ammonia regulator flow rate set to apply about 10 lb. of ammonia per ton of silage. However, the amount of anhydrous ammonia ultimately applied averaged 12.5 lb. per ton due to variations in regulator efficiency and unloading rate. The forage sorghum yielded 9.2 tons per acre with an average dry matter content of 36%. Crude protein content of the control silage averaged 7.9% on a dry basis.

One hundred Black Angus steers from a single herd in western South Dakota were used for the study. The short yearlings were allotted into four pens of 25 head each with shrunk body weights obtained after an 18-hour stand without feed and water. The steers were housed in an enclosed barn with access to outside concrete lots. All steers were implanted with Ralgro, poured with a half dose of Warbex for lice control and wormed with a TBZ feed additive prior to the start of the trial on March 30, 1979. One animal died of pneumonia during the trial.

Two pens of cattle received a full feed of control silage plus 2 lb. of soybean meal and 6 lb. of cracked corn per head daily, while the other two pens were full fed the anhydrous ammonia-treated silage plus 8 lb. of cracked corn per head daily. All cattle received 1 ounce of a high iodine trace mineral salt to control foot rot and .5 lb. of a custom supplement per head

per day. The supplement consisted of 65% ground corn, 22% dicalcium phosphate, 10% trace mineral salt and 3% of a Rumensin-vitamin A premix to provide 200 mg. of Rumensin and 30,000 I.U. of vitamin A per head daily. All steers received 1 lb. of a 38% protein supplement, 2.5 lb. of alfalfa hay and .2 lb. of a high level antibiotic (AS-700) per head daily during the first 4 days of the trial.

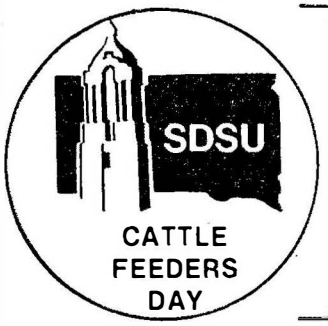
Results

The results of the 91-day trial are presented in the table. Average daily gains of the steers fed the two silages were very similar (2.24 vs. 2.18 lb.). However, the cattle fed the anhydrous ammonia-treated forage sorghum consumed about 7.5 lb. (24%) less silage than the control silage fed steers, while maintaining comparable weight gains. Thus, the total pounds of feed required per pound of gain was about 17.5 lb. with the control silage and about 14.6 lb. with the ammonia-treated silage (as fed basis), or about 16.7% better feed efficiency with the latter ration.

These results suggest that anhydrous ammonia is an effective silage additive for forage sorghum. However, additional studies are necessary to confirm these original research findings. It should be noted that the Cold-Flo anhydrous ammonia treatment of forage sorghum is not technically approved by FDA at this time.

Table 1. Effectiveness of Cold-Flo Anhydrous Ammonia With Forage Sorghum Silage

Item	Control silage	Ammonia-treated silage
No. of steers	50	49
Initial shrunk wt., lb.	625.9	623.4
Final shrunk wt., lb.	829.8	821.7
Avg. daily gain, lb.	2.24	2.18
Avg. daily ration, lb. (as fed)		
Silage	30.80	23.33
Cracked corn	6.02	7.87
Soybean meal	1.86	--
Supplement	.52	.52
Trace mineral salt	.05	.05
Total	39.25	31.77
Lb. feed/lb. gain (as fed)		
Silage	13.74	10.71
Cracked corn	2.69	3.61
Soybean meal	.83	--
Supplement	.23	.24
Trace mineral salt	.02	.02
Total	17.51	14.58



EFFECTS OF SEX AND HORMONAL IMPLANT ON BEEF CARCASS CHARACTERISTICS AND PALATABILITY

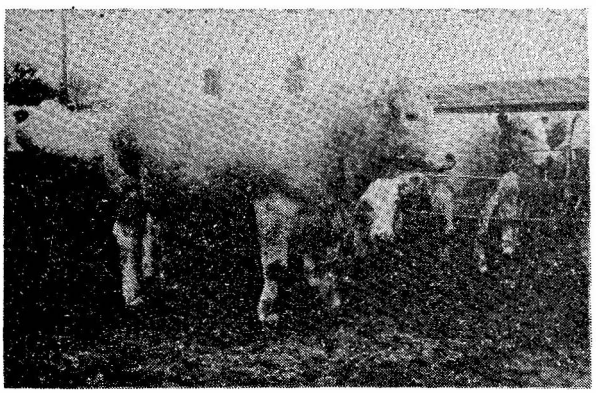
J. D. Stout, D. H. Gee, G. L. Kuhl
and C. W. Carlson
Department of Animal Science Report
CATTLE 81-7

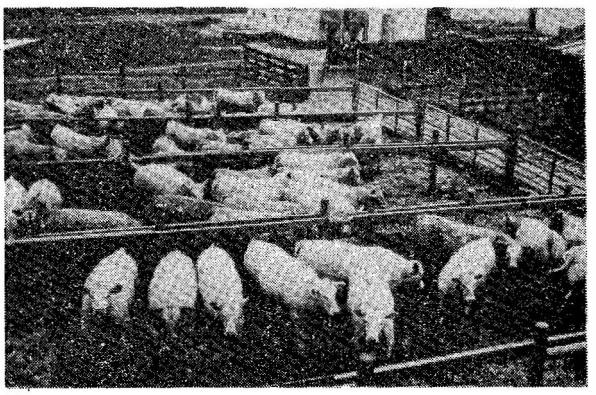
Summary

A comparison of crossbred bulls, steers and heifers indicated that bulls have heavier carcasses, larger rib eyes and a more desirable yield grade. The USDA quality grade of the bulls was one-third of a grade lower than for the steers and heifers. The sensory and palatability characteristics showed no significant differences among sexes. Implanted bulls as compared to non-implanted bulls showed more desirable taste panel scores for tenderness, juiciness and overall panel desirability.

Introduction

Today's calorie and price conscious American consumer is seeking trim, lean, competitively priced meat products. As grain becomes more scarce in an effort to feed worldwide populations and the demand for animal protein increases, it may become necessary to increase the amount of beef produced and at the same time increase production efficiency. The current increased demand for ground beef and processed meat items may encourage producers to look at some alternatives in beef production.





The Charolais crossbred cattle on feed at the Southeast South Dakota Experiment Farm.

Procedure

Ninety-eight Charolais cross cattle were used to evaluate the effect of sex and implant on carcass characteristics and palatability. The cattle consisted of 24 bulls, 22 steers and 52 heifers all artificially sired by the same Charolais bull. All animals were raised under South Dakota conditions and given Ralgro implants twice during the preweaning period. Immediately postweaning all animals were divided by sex as nearly as possible into eight equal groups. One-half of the animals in each pen were randomly selected to be implanted with Synovex according to the required sex treatment on the label. The cattle were fed in outside concrete lots with fence-line bunks and cable fences.

The cattle were fed identical diets of 75% Cold-Flo ammonia-treated corn silage and 25% cracked shelled corn (as fed) plus a commercial supplement for the first 73 days. The cattle were then switched to a ration of 75% whole shelled corn and 25% of the same corn silage (as fed) plus supplement for the remainder of the trial. The cattle previously implanted were reimplanted at the start of the finishing phase.

At the conclusion of the feeding trial, the cattle were slaughtered at a commercial packing company. A USDA grader provided the quality and yield grade information at the packing plant. The wholesale rib from one side of each carcass was transported to the SDSU meat lab. The rib was used to provide detailed information regarding the fat, bone and lean content of the carcasses. In addition, samples were taken from the rib to provide for Warner-Bratzler shear, proximate analysis and taste panel evaluation.

Results

The mean values for carcass characteristics according to sex are reported in table 1. Bulls and steers were significantly heavier and thus produced heavier carcasses than heifers. The bulls were about 1% higher in dressing percent than the other sexes. The rib eye size was largest for the bulls followed by the steers and heifers. Fat thickness showed no significant differences among sexes. The heifers had a significantly higher percentage of kidney, heart and pelvic fat. The marbling scores were highest for the heifers followed by the steers. The steers and heifers qualified for the USDA choice quality grade, while the bulls graded high good. Yield or cutability grade showed no significant differences among the sexes.

Table 2 shows the mean values for the separable lean, fat and bone components of the 9-10-11 rib. Previous research has indicated that the 9-10-11 rib components are highly ($P<.001$) related to corresponding tissue components of the total carcass. As indicated in table 2, bulls had a higher percentage bone than the steers or heifers. The bulls had significantly less subcutaneous, intermuscular and intramuscular fat as well as less total fat. Heifers and steers had about the same percent lean, whereas bulls had a significantly higher amount of lean. The data showed no significant differences for muscle-to-bone ratios among the sexes.

Table 3 presents the sensory and palatability characteristics of bull, steer and heifer carcasses. There were no significant differences in any of the values reported in table 3 which indicates no major palatability differences among bulls, steers and heifers. The bulls showed a trend toward

Table 1. Carcass Characteristics of Crossbred Bulls, Steers and Heifers

Trait	Bulls	Steers	Heifers
Live wt., lb.***	1271[a]	1233[a]	1127[b]
Carcass wt., lb.***	817[a]	782[a]	711[b]
Dressing percent	64.3	63.4	63.1
Rib eye area, sq. in.***	15.1[a]	14.3[ab]	13.7[b]
Fat thickness, in.	.20	.21	.24
Kidney, heart and pelvic fat, %***	2.4[a]	2.7[ab]	3.2[b]
Marbling score**	Slight+[a]	Small+[b]	Small-[ab]
Quality grade**	Good+[a]	Choice-[b]	Choice-[ab]
Yield grade	1.8	2.0	2.1
Days of age***	441[a]	441[a]	430[b]

* P<.05 level of significance.
** P<.01 level of significance.
*** P<.001 level of significance.
[a,b] Means with similar superscript letters do not differ significantly from each other (P<.01).

Table 2. Mean Values for Separable Components of 9-10-11 Rib By Sex

	Sex classification		
Trait	Bulls	Steers	Heifers
Bone, %*	13.8[a]	13.2[ab]	12.9[b]
Fat, %**	30.2[A]	34.7[B]	34.8[B]
Subcutaneous, %***	6.4[A]	7.9[B]	8.4[B]
Intermuscular, %***	21.6[A]	24.4[B]	23.4[B]
Intramuscular, %**	1.4[A]	1.5[AB]	1.8[B]
Lean, %***	56.0[A]	52.1[B]	52.2[B]
Muscle-to-bone ratio	4.1	4.0	4.1

* P<.05 level of significance.
** P<.01 level of significance.
*** P<.001 level of significance.
[a,b] Means with similar superscript letters do not differ significantly from each other (small letters = P<.05; capital letters = P<.01).

Table 3. Mean Values for Sensory and Palatability Characteristics by Sex

Trait	Sex classification		
	Bulls	Steers	Heifers
Juiciness[a]	5.4	5.2	5.2
Tenderness[b]	5.3	5.8	5.5
Connective tissue amount[c]	4.8	5.2	5.2
Flavor desirability[d]	5.3	5.7	5.6
Overall desirability[d]	5.1	5.5	5.5
Cooking loss, %	28.3	30.3	29.9
Shear, kg.	4.7	4.0	4.3

[a] Extremely dry = 1, slightly juicy = 5, extremely juicy = 8.
[b] Extremely tough = 1, slightly tender = 5, extremely tender = 8.
[c] Abundant = 1, slight = 5, none = 8.
[d] Extremely desirable = 1, slightly desirable = 5, extremely desirable = 8.

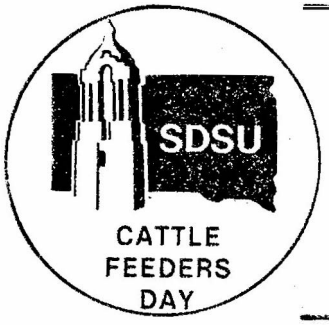
decreased tenderness, slightly more connective tissue and less flavor desirability. However, the bulls showed a trend toward increased overall eating desirability and lower cooking losses.

Table 4 displays the mean values for sensory and palatability characteristics by sex and hormonal treatment. Significant differences were found with regard to tenderness, in that implanted bulls were more tender than their nonimplanted controls, while heifers and steers showed the reverse effect when implanted. Juiciness and the amount of connective tissue also followed the same trend. Overall eating desirability also indicated that implanted bulls were more desirable than the nonimplanted bulls. However, in the case of the steers and heifers, the nonimplanted cattle had higher overall desirability scores than the implanted cattle. These data suggest that implanted bulls may more closely resemble steer and heifer quality, palatability and sensory characteristics.

Table 4. Mean Values for Sensory and Palatability by Sex and Hormonal Treatment

	Bulls		Steers		Heifers	
	Control	Implant	Control	Implant	Control	Implant
Juiciness*	5.0_{A}	5.7_{B}	5.2_{B}	5.2_{B}	5.4_{B}	5.1_{AB}
Tenderness***	4.7_{A}	5.9_{B}	5.9_{B}	5.7_{B}	6.0_{B}	5.0_{AB}
Connective tissue amount	4.6^{a}	5.1^{ab}	5.3^{b}	5.1^{ab}	5.5^{b}	4.9^{ab}
Flavor desirability	5.3_{A}	5.4_{AB}	5.8_{B}	5.6_{AB}	5.7_{B}	5.2_{AB}
Overall desirability*	4.8_{A}	5.4_{AB}	5.6_{B}	5.4_{AB}	5.7_{B}	5.3_{AB}
Cooking loss, %	29.4	27.2	30.6	30.0	29.6	30.2
Shear, kg.	4.9	4.6	3.7	4.2	3.8	4.8

* $P<.05$.
*** $P<.001$.
^{a,b} Means with similar superscript letters do not differ significantly from each other (small letters = $P<.05$; capital letters = $P<.01$).



CATTLE MARKETING ALTERNATIVES

Gene Murra
Extension Economist, Livestock Marketing
Department of Animal Science Report
CATTLE 81-8

Summary

In most cases, the time spent on marketing an agricultural producer's product will pay big dividends. Or, time not spent can cause potential profits obtained in the production process to be lost in the marketing process.

Any marketing effort takes time. But, by carefully evaluating which market outlet to use and when to price his product, the producer will receive, in most cases, a higher net price and greater profits.

Introduction

While considerable time is spent on the production of fed cattle, many producers spend little time on marketing their product. Someone once said the successful producer should spend as many days marketing as he does in production, maybe even more. This does not mean he should spend as many hours each day on marketing as on production. Rather, he should start thinking about marketing as soon as, or before, he starts the production process.

The areas will be discussed here--(1) factors to be considered in selecting the type of market to use and (2) factors affecting when to price the product.

Selecting the Type of Market to Use

Several factors affect the decision on whether to market fed cattle through an auction, terminal market, direct to a packer or sale at the feedlot. Most producers think first about gross or total price. While that is important, it is only a starting point. Beating your neighbor in terms of total or gross selling price may give bragging rights at the bar, but it does not guarantee the highest net price or return. While determining the exact gross price obtainable from several market outlets may not always be easy, the producer usually can make realistic estimates by contacting or visiting outlets and/or buyers.

In addition to price, the smart producer will figure marketing charges made to him for selling his cattle, shrinkage charged against the sale weight or lost in movement to market and transportation charges. For example, a $75.00 selling price is quickly reduced to $71.00 when a $1.00 per hundredweight marketing charge, a three percent shrink and a $.75 per hundredweight transportation charge are deducted. And, the charges can be much higher than those noted.

How can the producer determine the amount of the above charges? First, marketing charges must be made available to the seller. Usually, they are posted at the market outlet. Since these charges can and do vary, they should be compared. A rough rule of thumb for shrinkage, if not penciled out at the feedlot, is to allow two percent just for loading and unloading and then another one percent for each 100 miles traveled. Transportation charges might be negotiable, but a general charge of $1.80 to $2.00 per loaded mile is typical. And, this could go higher as energy costs go up.

Determining When To Price

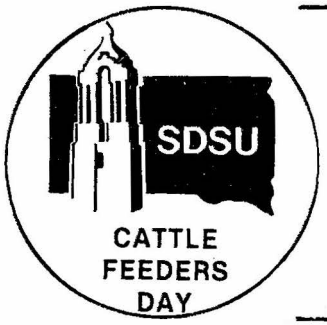
Two options are available--(1) pricing the product at the time of sale and (2) pricing sometime prior to time of sale, either by contracting or using the futures market.

When pricing at time of sale, the seller may have an option to sell on a live weight or grade and yield basis. Generally, if the producer has a high percentage of higher yielding cattle, say yield grades 1 and 2, he should investigate selling on a grade and yield basis. However, if his cattle are in the yield grade 4 and 5 categories, the live weight pricing method may be most advantageous to him. Checking prices for the various grades and yields at several markets may provide big dividends.

Use of contracting and the futures market will remove most of the risk of an unfavorable price change. Here, it must be remembered that, if the price was acceptable when the "deal was made," it must be acceptable at the delivery. If contracting is used, the time and method of delivery of the product usually is specified. If the futures market is used, delivery against the contract seldom is made. Therefore, traditional market outlets still must be analyzed and evaluated because the product will be marketed that way. Also, use of the futures market is a marketing tool which requires more study and information, not less. If you plan to use it, plan to do some studying first.

The factor which usually decides if pricing is done at the time of marketing or before is the amount of price risk the seller is able and wants to stand. If he wants to absorb all of that price risk, he will wait until time of sale to price his product. If he wants to shift some of that risk to someone else, he will contract or use the futures market.

Of course, other factors, such as the prices he can obtain, price outlook, desires of the financial source and general knowledge of alternatives, also play a role in when and how to price the product.



PROTEIN SUPPLEMENTATION WITH AND WITHOUT ROUGHAGE IN CATTLE FINISHING RATIONS

L. F. Palmer, L. B. Embry, R. M. Luther
and M. J. Goetz
Department of Animal Science Report
CATTLE 81-9

Summary

One hundred twenty-eight Angus-Hereford steers averaging 760 lb. initially were fed for 118 days to determine the value of adding 10% roughage dry matter as alfalfa-brome haylage and supplemental protein (1.26 percentage units) to an all-concentrate ration (10.13% protein).

Supplemental protein or alfalfa-brome haylage (11.39 and 10.70% protein rations) increased feed consumption and weight gain. The improvement was confined largely to the first 1 to 2 months of the experiment. Supplemental protein in addition to the added roughage had only a small early effect.

After 2 months when average feedlot weights of the cattle exceeded 940 lb. and average dry feed intake was in excess of 19 lb., there was no apparent benefit from either the low level of roughage or supplemental protein. However, there was some overall improvement at termination of the experiment in weight gain and feed efficiency from the roughage addition and supplemental protein. The advantage from roughage appeared to be largely a management factor, especially early in the experiment. Since total feed requirements were not increased from the roughage addition, roughage at the level fed would appear advisable in these finishing rations.

Carcass characteristics did not appear to be affected by dietary treatment other than reflections of faster gains and heavier carcasses.

Introduction

In previous research we examined the effects of low levels of roughage (10% of dry ration) and protein supplementation with corn grain finishing rations for yearling steers (ca 680 lb. initially). The importance of roughage quality under these conditions was also studied using brome hay and wheat straw for good and low quality roughages. No roughage control rations contained 11.3% protein (dry). Brome hay additions resulted in essentially no change in protein level of rations. Soybean meal supplementation increased the percentage of protein about .7 units, while the wheat straw decreased the level of ration by about the same amount.

Roughage additions and protein supplementation improved feed intake, weight gain and feed efficiency during the first 1 to 2 months of the experiment. Thereafter, wheat straw reduced performance which was improved by protein supplementation. Cattle fed wheat straw and supplemental protein had similar performance as those fed rations with about the same level of protein but with brome hay and no supplemental protein.

Roughage at the low level appeared to be beneficial as a management factor, especially during feedlot adaptation, rather than in reducing grain requirements. Additional research appeared desirable with roughage and protein supplementation using higher quality roughage than brome hay.

The experiment reported herein compared an all-concentrate ration to ones supplemented with alfalfa-brome haylage, a soybean meal base supplement and a combination of haylage and supplemental protein.

Procedures

One hundred twenty-eight Angus-Hereford steers were used in the experiment. They were full fed oat haylage and given access to a mineral supplement for about 5 weeks prior to the start of the experiment. Processing treatments for the cattle included a four-way Clostridium bacterin, Warbex pour-on and Ralgro implants.

The steers were allotted into eight pens of 16 each on basis of weight. Dietary treatments replicated two times were as follows:

1. All-concentrate control
2. All-concentrate with 10% of ration as a protein supplement
3. Same as 1 with 10% of ration dry matter from alfalfa-brome haylage
4. Same as 2 with 10% of ration dry matter from alfalfa-brome haylage.

Ingredient composition of the rations is shown in table 1. The rations were fed as three components--corn grain, alfalfa-brome haylage and a pelleted supplement. The corn grain fed whole was from several sources and averaged 20% moisture and 10.36% protein (dry). The haylage averaged 42% moisture and 16.08% protein (dry). The supplement fed in rations with supplemental protein contained 20.68% protein (dry). Each ration had a different level of protein but with the increase from protein supplementation being the same in percentage units (1.26) for rations with and without roughage.

Percentages of each ration ingredient in the dry ration were converted to the proper ratios as fed. Feeding schedules were prepared for various levels of feeding. The rations were batched mixed according to the schedules for each pen and fed once daily. The initial feeding was equal to 8 lb. of dry matter per head. Increases for each ration were 1.5 lb. dry matter per head daily for each pen of cattle until they were on full feed after about 7 to 10 days. Thereafter, rate of feeding was regulated to amounts that would be nearly consumed by the next feeding.

The experiment was terminated after 118 days. The cattle were marketed and carcass data obtained.

Table 1. Ingredient Composition of Feedlot Rations[a]

Ingredients	No roughage		Alfalfa-brome haylage	
	Corn supplement	Protein supplement	Corn supplement	Protein supplement
	%			
Corn grain	90	90	80	80
Alfalfa-brome haylage	--	--	10	10
	Supplement[b]			
Ground corn grain	8.00	4.40	8.00	4.40
Soybean meal (44%)	--	3.60	--	3.60
Limestone	.75	.75	.75	.75
Dicalcium phosphate	.25	.25	.25	.25
Trace mineral salt	.40	.40	.40	.40
Potassium chloride	.60	.60	.60	.60
Avg. protein content (dry)	10.13	11.39	10.70	11.96

[a] Each ration contained 1500 I.U. vitamin A, 150 I.U. vitamin E and 15 mg. of Rumensin per pound.

[b] Ingredients listed below this point are shown as a percent of the total ration but were incorporated into a pelleted supplement and fed at 10% of the dry diet.

Results

Feed Consumption

Average daily feed consumption accumulated by weigh periods for each treatment group is shown in table 2. Feed consumption increased with increasing weight and time on experiment.

Supplementing the all-concentrate ration (10.13% protein, dry) with additional protein (11.39%, dry) increased feed intake for the first 2 months. The cattle weighed around 940 lb. or more at this time. From 56 days until the end of the 118-day experiment, supplemental protein had no apparent effect on feed consumption. Supplemental protein with added roughage (10.70% protein ration) did not appear to affect feed consumption at any point in the experiment.

Roughage added at 10% of the ration dry matter increased feed consumption. The increase over the no roughage control group was greater than when the no roughage ration was supplemented with additional protein. The increase in feed intake from roughage supplementation was less than the amount of roughage in the ration. Roughage then reduced the total concentrates consumed by the cattle.

Weight Gain

Accumulated average daily gain by weigh periods for each treatment group is shown in table 3. Daily gains shown are based on carcass weight and a carcass yield of 62%. This procedure was used since the cattle had a considerable amount of manure because of animal density per pen and weather conditions late in the experiment. This procedure was considered to more accurately represent animal response to the various dietary treatments.

Table 2. Cumulative Feed Intake by Weigh Periods as Affected by Roughage and Protein Supplement

Item	No roughage		Alfalfa-brome haylage	
	Corn supplement	Protein supplement	Corn supplement	Protein supplement
No. of animals	32	32	32	32
Init. shrunk wt., lb.	761	760	765	760
Final adjusted wt., lb.[a]	1095	1132	1143	1149
Avg. daily feed, lb.[b]				
28 days	13.15	14.80	15.59	15.94
56 days	17.29	18.78	19.75	19.62
85 days	19.13	19.92	20.95	20.85
118 days (filled)	20.06	20.75	21.79	21.81

[a] Calculated from carcass weight and a carcass yield of 62%.
[b] Feed values shown in this table are on a dry matter basis.

Protein supplementation in rations without roughage increased rate of gain during the first 2 months of the experiment. From 56 to 118 days, there appeared to be little if any effect on weight gain from supplemental protein.

There also appeared to be some benefit on weight gain from supplemental protein to rations with roughage. However, the response was less than for no roughage rations and appeared evident only during the first month of the experiment.

Roughage supplementation at 10% of ration dry matter also improved weight gain. The effect was more pronounced and for a longer period of time in rations without supplemental protein. Without supplemental protein, the effect was primarily for the first 2 months and 1 month with supplemental protein.

Table 3. Cumulative Weight Gain by Weigh Periods as Affected by Roughage and Protein Supplement

Item	No roughage		Alfalfa-brome haylage	
	Corn supplement	Protein supplement	Corn supplement	Protein supplement
Avg. daily gain, lb.				
28 days	1.82	2.47	2.94	3.27
56 days	3.27	3.91	4.16	4.29
85 days	3.46	3.88	3.73	3.94
118 days (filled)	3.13	3.50	3.45	3.59
118 days (adjusted)[a]	2.83	3.15	3.20	3.29

[a] Based on carcass weight and a carcass yield of 62%.

Feed Efficiency

Feed efficiency data accumulated by weigh periods are shown in table 4. There was a reduction in feed required per unit of gain with supplemental protein during the first month when getting the cattle on full feed. The reduction was most pronounced for steers fed all-concentrate rations. After the second month, there was an increase in feed requirements with increasing weight and time on experiment.

Table 4. Cumulative Feed Efficiency by Weigh Periods as Affected by Roughage and Protein Supplement

Item	No roughage		Alfalfa-brome haylage	
	Corn supplement	Protein supplement	Corn supplement	Protein supplement
Feed/gain ratio[a]				
28 days	724	599	536	491
56 days	530	481	478	458
85 days	554	514	564	530
118 days (filled)	624	593	632	605
118 days (adjusted)[b]	698	652	675	656

[a] Feed values used were on a dry matter basis.
[b] Based on carcass weight and a carcass yield of 62%.

The supplemental protein (soybean meal) comprised only 3.6% of the dry rations or 36% of the protein supplement. In view of the effects on feed consumption and weight gain, the effect of increasing the protein level of the no roughage ration from 10.13 to 11.39% was an improvement in feed efficiency during the first 2 months only. However, some of the initial advantage was maintained throughout the experiment.

Roughage addition to the ration without supplemental protein which increased the protein content from 10.13 to 10.70% resulted in a pronounced reduction in feed requirements during the first month of feedlot adaptation. Any benefits after this time appeared mainly a reflection of the early advantage.

There was also an advantage for supplemental protein with roughage. It was much less than for the ration without roughage and occurred mostly during the initial month of feedlot adaptation.

The feed efficiency by ingredients for the 118-day experiment is shown in table 5. It will be noted here that in rations without roughage each 1 lb. of soybean meal saved 2.81 lb. of corn grain on basis of feed efficiency. In rations with roughage, the saving in corn grain from protein supplementation was much less (1.7 lb.). The haylage appeared to save about an equal amount of dry matter from grain.

Table 5. Feed to Gain Ratio After 118 Days

Item	No roughage		Alfalfa-brome haylage	
	Corn supplement	Protein supplement	Corn supplement	Protein supplement
Feed to gain ratio[a]				
Corn grain[b]	683.6	615.0	604.6	563.0
Alfalfa-brome haylage[c]	--	--	57.1	55.4
Minerals	14.0	13.0	13.5	13.1
Soybean meal	--	24.4	--	24.6
Total	697.6	652.4	675.2	656.1

[a] Values presented here are on a dry matter basis and based on the adjusted weights of the steers.
[b] Includes corn portion of the supplement.
[c] Determined from daily amounts fed and dry matter values periodically during the experiment. Values are about 8.5% of ration dry matter rather than the 10% scheduled.

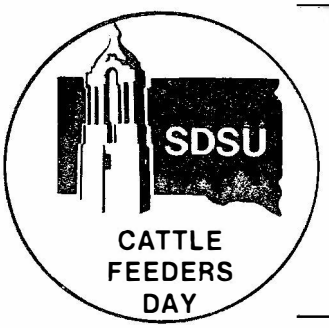
Carcass Data

Average carcass grades were approximately low choice (table 6). Differences shown are small and appear to be more reflections of differences in carcass weights than dietary treatments.

Table 6. Carcass Data

Item	No roughage		Roughage	
	Corn supplement	Protein supplement	Corn supplement	Protein supplement
Hot carcass weight, lb.	679	702	708	712
Marbling[a]	4.8	5.0	5.1	5.3
Carcass grade[b]	18.5	18.9	18.9	19.2
KPH fat, %	1.7	1.8	2.0	2.0
Rib eye area, sq. in.	11.37	11.28	11.62	11.59
Fat thickness, in.	.58	.59	.63	.61

[a] Moderate = 7, modest = 6, small = 5.
[b] Prime = 23, choice = 20, good = 17. Graded to one-third grade.



SCABIES RESEARCH WITH INJECTABLE IVERMECTIN

J. Bailey, G. Kuhl, H. Miller, H. Shave
and D. Thorpe
Department of Animal Science Report
CATTLE 81-10

Introduction

Scabies is a parasitic skin disease caused by tiny mites resulting in skin irritation. These mites are spread from animal to animal by direct contact. The mites puncture the skin and feed on the body fluids released from the wounds. These fluids ooze from wounds and dry to form scabs. Hence the name "scabies." This disease costs the cattle industry millions of dollars each year.

Cattle with scabies lick, rub and scratch themselves to relieve the intense itching. They often lose weight and are more susceptible to complications such as pneumonia. As the number of mites increase, the animal's hair falls out or is rubbed off and lesions spread. If not treated, large areas of the body may be covered with thick, rough crusts.

Scabies is a year-round problem. However, in warm weather skin lesions may disappear because mites are less active. This improvement is only temporary; and, as environmental temperature gets colder, the mites become active and lesions return.

Under normal conditions, mites will survive for a maximum of 3 days off the host animal. It is possible for mites to spread from fences or trucks that have been in contact with infected animals. However, the greatest possibility of spread is directly animal to animal.

Current Methods of Treatment and Control

Treatment is best accomplished by complete immersion of infected animals in an approved pesticide. Two dippings 12 to 14 days apart are required for treating infected cattle.

Pesticides approved by the USDA for scabies control are toxaphene, prolate and Co-Ral. Lime sulfur solution is also on the approved list but is seldom used because the dipping solution must be heated to be effective.

The South Dakota Livestock Sanitary Board has approved toxaphene as the official pesticide used in the control program within South Dakota.

Nonquarantined cattle may move interstate with only one dip. The organophosphate compounds (prolate and Co-Ral) have not proven as effective as toxaphene on a single treatment basis.

Recent EPA regulations have caused concern over the future use of toxaphene, and it is problematic how much longer it will be available.

Experimental Use of Ivermectin

Merck, Sharp and Dohme Inc. has been researching an entirely new concept in parasite control. A new antiparasitic agent called "Ivermectin" has shown high efficacy against a wide spectrum of parasites in several species of animals.

Ivermectin is produced by the fermentation of Streplomyces avermitilis. It is actually an antibiotic with no antibacterial activity but is effective against certain internal and external parasites by both oral and injectable routes of administration.

A research trial was developed at SDSU to evaluate the effectiveness of Ivermectin in the treatment of cattle scabies. The study was conducted cooperatively by the SDSU Animal Disease Research and Diagnostic Laboratory, the Department of Animal Science and the South Dakota Livestock Sanitary Board (SDLSB) in conjunction with Merck, Sharp and Dohme.

Twenty scabies-infected calves with substantial skin lesions were obtained in close coordination with the SDLSB. The calves were transported to the Southeast South Dakota Experiment Farm under quarantine in March, 1980. The cattle consisted of 14 steers and 6 heifers averaging about 500 pounds.

At the start of the trial, each calf was individually ear tagged and weighed. An initial skin scraping was taken to verify the presence of mites and establish a positive diagnosis of Psoroptic scabies. The calves were then randomly allotted to six pens with one heifer randomly assigned to each pen. The pens were double fenced to prevent contact between adjacent lots. The cattle in three of the pens were subcutaneously injected on day 1 with 200 micrograms per kilogram body weight (1 ml./cwt.) of MK-933, the experimental Ivermectin compound, while the animals in the other three pens served as untreated controls.

Subsequently, eight skin scrapings were collected from each calf at weekly intervals to determine the presence or absence of the scabies mites. A calf profile chart was made for each calf to show the sites of lesions on the body and where each scraping was made. The skin scrapings were examined microscopically at the SDSU Veterinary Diagnostic Laboratory using the maceration-flotation technique.

Daily feed consumption and weekly body weight records were obtained during the 8-week trial. The ration consisted of 4 lb. cracked corn and 1 lb. of a 38% commercial protein supplement per head daily plus a full feed of corn silage. The Ivermectin-treated cattle were always handled through the work facilities first for weighing and skin scrapings to avoid possible reinfection from the untreated controls. The chute was cleaned and sprayed with toxaphene after the cattle were worked each week. Care was taken to insure that these cattle remained isolated from other livestock.

The results of the skin scrapings are shown in table 1. All animals tested positive for mites on the initial scraping. At the second scraping on day 8, only three of the treated animals were diagnosed positive. On subsequent scrapings, no mites were found on any of the Ivermectin-treated cattle. Itching and skin irritation decreased and by day 28 of the trial hair and skin on the treated animals appeared normal.

Table 1. Results of Skin Scrapings Taken From Control and Ivermectin-Treated Calves

Animal no.	Skin scraping date								
	3/31	4/7	4/14	4/21	4/28	5/5	5/12	5/19	5/26
				Control Calves					
1	+	+							
2	+	+			+				+
3	+	+							
4	+	+							
5	+								
6	+	+	+	+	+	+		+	+
7	+	+							
8	+	+	+						
9	+	+					+	+	+
10	+	+	+						
				Treated Calves					
11	+								
12	+								
13	+	+							
14	+								
15	+	+							
16	+								
17	+								
18	+								
19	+	+							
20	+								

+ indicates presence of mites. No sign depicts absence of detectable mites in scrapings.

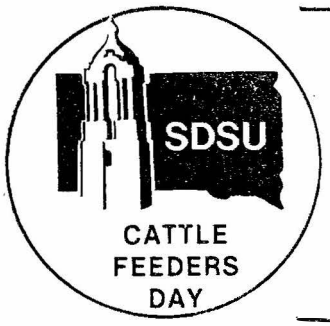
In contrast to the treated calves, some of the control animals continued to be positive for mites throughout the entire 8-week trial. In April, environmental temperature reached the 90's for several days. Since mite activity is reduced by warm temperatures, the absence of any detectable mites on some control animals after the third or fourth week may have been due to the unseasonably warm weather during April. Even though live mites were not found on some controls mid-way through the trial, skin condition and hair coat did not substantially improve, with the skin remaining leathery and thickened. Body weight gain and feed consumption of the treated and control calves were not notably different.

Data from this trial were forwarded to Merck, Sharp and Dohme for inclusion in their submission to FDA concerning clearance of Ivermectin for scabies control.

After termination of the 8-week trial, the control animals were injected with Ivermectin at the same dosage (200 mcg./kg.) as the previously treated animals. Following this treatment, control animals responded in the same manner as the previously treated cattle, and within a month their skin was nearly normal in appearance.

At the request of the SDLSB, animals were retained after the initial 8-week study to evaluate the long-term effectiveness of the drug. The cattle were combined into one large pen and kept on feed through the summer and fall to determine if all of the scabies mites were actually killed by the Ivermectin or if cold weather would reactivate any dormant mites that may have survived.

Cattle were examined by the State Veterinarian and SDSU Veterinary Diagnostic Laboratory personnel on December 16 to evaluate the final health status. All cattle were determined to be free of any clinical signs of scabies. Thus, it appears that Ivermectin is effective in the treatment and control of cattle scabies.



EFFECT OF CEMENT DUST AND REIMPLANTING ON FINISHING HEIFER PERFORMANCE[1]

G. Kuhl, C. Carlson, G. Williamson and L. Embry
Department of Animal Science Report
CATTLE 81-11

Summary

Eighty crossbred yearling heifers were used to determine the possible benefit of including 2% cement kiln dust in a typical high-concentrate finishing ration. The value of reimplanting with Ralgro during a 151-day feeding period was also evaluated.

Cattle on the cement dust ration gained 13% slower and ate 6.3% less feed per day than control heifers, resulting in an 8.5% poorer feed conversion with cement dust. Carcass quality and yield grades were not affected by cement dust in the ration.

In this study, no benefit was observed from implanting heifers twice during a 151-day feeding period as compared with a single implant in terms of finishing trial performance or carcass characteristics.

Introduction

Recently, certain studies have indicated that including cement kiln dust, a waste by-product of the cement industry, in the rations of livestock may increase performance. However, the trials to date have been inconsistent, with some experiments finding no effect and others actually showing decreased performance by adding cement dust to rations. While the possible mode(s) of action of cement dust is unknown, several theories have been proposed, including its action as a buffer and as a source of certain trace minerals. It appears that considerable variation exists in the mineral composition and possible growing-promoting effects of cement dust from various states and plants.

The objective of this trial was to compare the performance of finishing heifers fed a high-concentrate ration with and without 2% cement dust from the South Dakota Cement Plant at Rapid City.

In addition, this study presented an opportunity to evaluate whether two successive Ralgro implants during a 151-day feeding period would promote better performance than a single initial implant.

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[1] Trial conducted at the Southeast South Dakota Experiment Farm, Beresford, South Dakota.

Experimental Procedures

Eighty crossbred yearling heifers averaging about 780 lb. were used for this 77-day finishing study. The heifers had been utilized on a corn silage additive trial at the Southeast Farm prior to this experiment. The cattle were allotted to eight pens of 10 head each with shrunk body weights obtained after an 18-hour stand without feed and water. Four pens were assigned to the cement dust ration and four pens to the control ration. Two pens of cattle on each ration were reimplanted with Ralgro on the first day of the trial. All heifers had been implanted with Ralgro 74 days previously.

The control ration consisted of 80% whole shelled corn, 10% chopped, poor quality alfalfa hay, 5% wet beet molasses and 5% pelleted custom supplement. The cement dust ration was identical to the control ration, except the 2% cement dust and 78% corn were fed. The wet molasses was used in the rations to minimize fines and prevent separation of the cement dust from the rest of the ration. The custom mixed supplement contained 75% ground corn, 5% dry cane molasses, 11.7% limestone, 6% trace mineralized salt and 2.3% Rumensin-vitamin A premix. The premix provided 30,000 I.U. of vitamin A per pound of supplement and 30 grams of Rumensin per ton of complete ration. The cattle were slowly brought up on the high-concentrate rations by decreasing the hay and increasing the shelled corn over the first 12 days of the experiment.

Analyses of the major ration feedstuffs yielded the following average values for moisture and crude protein, respectively: alfalfa hay, 10.6% and 16.2%; shelled corn, 11.6% and 11.0%; and supplement, 10.0% and 9.6%. The cement dust which was obtained from the South Dakota Cement Plant stockpile in Rapid City contained .45% moisture, 33.9% calcium and .04% phosphorus.

The heifers were fed in open, sloped concreted lots without access to enclosed shelter. Daily feed records were kept on each pen and individual heifer weights were obtained at monthly intervals. The experiment was terminated after 77 days on feed, at which time the average full body weight of the heifers was about 1000 pounds. The cattle were sold on a grade and yield basis so that detailed carcass data could be obtained.

Results

The feedlot performance and carcass characteristics of heifers as influenced by cement dust in the ration and by reimplanting is shown in the table. Averaged across implant groups, the daily gain of heifers on the control ration was 2.70 lb. compared with 2.32 lb. for the cement dust-fed cattle. Thus, feeding 2% cement dust in the ration decreased rate of gain by about 13%. Daily feed consumption was also decreased an average of 6.3% with cement dust, and the amount of feed required per pound of gain was increased 8.5%.

These results are consistent with recent Alabama and Oklahoma trials in which feedlot performance was decreased by adding 2 to 3% cement dust to high-concentrate finishing rations.

Carcass characteristics were not materially influenced by including cement dust in the ration, except for lower carcass weights and smaller rib eye areas associated with lower final body weights of the cement dust-fed heifers. Thus, there does not appear to be any advantage to adding

Table 1. Effect of Cement Dust and Reimplanting on Finishing Heifer Performance

Item	Single implant		Reimplanted	
	Control	Cement dust	Control	Cement dust
No. heifers	20	20	20	20
Initial shrunk wt., lb.	779.6	777.0	779.0	779.0
Final shrunk wt., lb.	999.8	960.2	974.2	952.0
Avg. daily gain, lb.	2.86	2.38	2.54	2.25
Avg. daily ration, lb. (as fed)				
Shelled corn	18.64	16.46	17.83	16.68
Chopped hay	3.86	3.62	3.76	3.68
Wet molasses	1.20	1.08	1.14	1.10
Supplement	1.17	1.06	1.12	1.08
Cement dust	--	.43	--	.44
Total	24.87	22.65	23.85	22.98
Lb. feed/lb. gain (as fed)	8.70	9.44	9.42	10.22
Hot carcass wt., lb.	607.4	578.4	589.8	580.2
Fat thickness, in.[a]	.40	.44	.39	.38
Rib eye area, sq. in.	11.74	11.35	12.25	11.92
Quality grade[b]	19.2	19.0	19.0	19.3
Yield grade	2.56	2.72	2.62	2.52
Percent liver abscesses	45	45	30	25

[a] Fat thickness measured over rib eye between the 12th and 13th ribs.
[b] Quality grade score: 18 = high good, 19 = low choice, 20 = average choice.

South Dakota cement dust to high-concentrate finishing rations, at least at levels approaching 2% of the ration. Indeed, this trial suggests that feedlot performance will be adversely affected. It should be noted that cement dust is not approved as a feed additive in livestock rations.

No feedlot performance benefit was achieved by reimplanting the heifers with Ralgro at the beginning of the 77-day finishing trial as compared to cattle receiving only one implant 74 days prior to the start of this trial. Indeed, rate of gain and feed efficiency of the cattle receiving two implants during the last 151 days on feed were somewhat lower. These results are in contrast to other studies which have shown a distinct advantage for reimplanting cattle when the feeding period was much over 150 days.

Overall, the crossbred heifers quality graded 82.5% low choice or better and yield graded over 76% number 1 and number 2.

per heifer daily. The Synovex-H implanted calves received a comparable commercial supplement at the same level but without MGA. Both supplements contained 32% crude protein, 4.0% calcium, 1.2% phosphorus, 3.5% salt and 20,000 I.U. vitamin A per pound.

Initial plans were to simply full feed the two silages along with the appropriate supplement. However, feed intake was rather poor with the sunflower silage, so 3 lb. of cracked corn per head daily was added to all rations as of the 11th day of the trial. The level of cracked corn was subsequently boosted to 5 lb. per head daily on January 22, in order to improve ration palatability and reduce the effects of the record low temperatures on animal performance.

The heifers were fed in open, sloped concrete lots without access to enclosed shelter. Daily feed records were kept on each pen of cattle and individual heifer body weights were obtained at monthly intervals throughout the 71-day trial.

Results

The comparative feedlot performance of heifers fed either sunflower or corn silage and receiving Synovex-H or MGA is shown in the table. When averaged across growth stimulant groups, the sunflower silage ration resulted in about 28% slower gains (.86 vs. 1.20 lb.) than the corn silage ration. Daily feed intake was reduced considerably with the sunflower ration (32.6 vs. 47.1 lb. as fed) with about 28% less sunflower silage consumed than corn silage. Lower palatability and high oil content of the sunflower silage was likely responsible for the reduced intake. About one-half of the sunflower silage dry matter consisted of seeds which contained about 38% oil. Overall, feed conversion was not significantly affected by silage type. However, relatively more grain and supplement were required per pound of gain on the sunflower ration due to the lower intake and rate of gain with this silage compared to corn silage.

Further experimentation is needed with sunflower silage to determine the optimum stage of maturity for ensiling sunflowers and to evaluate different feed proportions and mixtures to improve sunflower silage palatability and feeding value. At present, it is suggested that sunflower silage be limited to less than one-half the total ration and mixed with highly palatable feeds to optimize cattle performance.

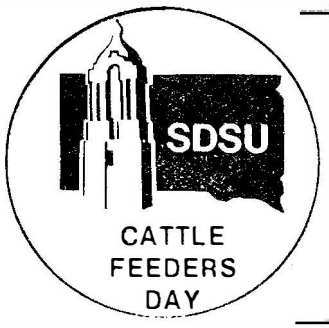
No material differences were observed between Synovex-H and MGA in terms of heifer gains, feed consumption or feed efficiency when averaged across silage types.

The Hereford-Angus cross heifers gained 13.4% faster than the Simmental-Angus cross calves with little differences in feed intake, resulting in over a 13% better feed conversion by the half-blood exotic heifers.

The extremely cold weather conditions during this trial resulted in greatly reduced feedlot performance by all groups of cattle.

Table 1. Comparison of Corn vs. Sunflower Silages With Growing Heifers Receiving Synovex-H or MGA

Item	Corn silage ration		Sunflower silage ration	
	Synovex-H	MGA	Synovex-H	MGA
No. of heifers	14	14	14	14
Initial shrunk wt., lb.	588.8	590.0	587.8	589.5
Final shrunk wt., lb.	670.2	678.1	652.6	647.9
Avg. daily gain, lb.	1.15	1.24	.91	.82
Avg. daily ration, lb. (as fed)				
Silage	41.9	42.4	27.5	27.8
Cracked corn	3.5	3.5	3.5	3.5
Supplement	1.5	1.5	1.5	1.5
Total	46.9	47.4	32.5	32.8
Lb. feed/lb. gain (as fed)				
Silage	36.6	34.2	30.3	34.7
Cracked corn	3.1	2.8	3.9	4.4
Supplement	1.3	1.2	1.6	1.8
Total	41.0	38.2	35.8	40.9



FEEDING VALUE OF PRO-SIL TREATED HIGH-MOISTURE GROUND EAR CORN WITH TWO GROUPS OF CROSSBRED HEIFERS[1]

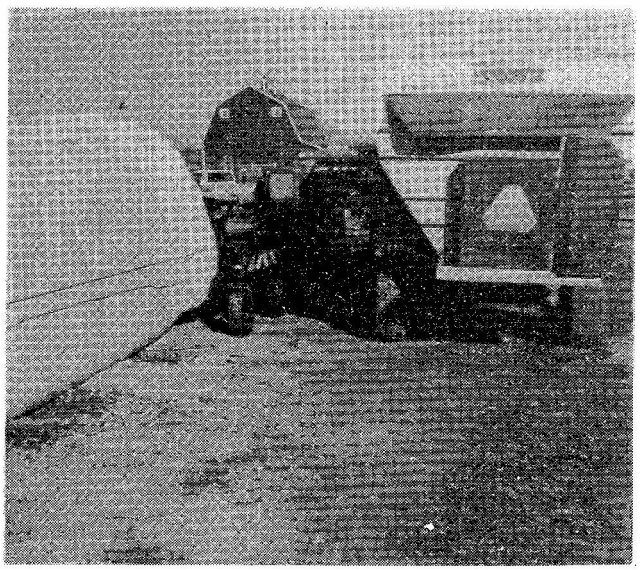
G. Kuhl, D. Whittington, M. Esser and A. Dittman
Department of Animal Science Report
CATTLE 81-13

Summary

British and exotic crossbred yearling heifers were used to evaluate the feeding value of high-moisture ear corn (HMEC) when either treated with Pro-Sil at ensiling time or supplemented with urea at feeding time.

Supplementation of regular HMEC with urea increased gains 20% and improved feed conversion about 17% compared to regular HMEC without added protein in the supplement.

The addition of Pro-Sil to HMEC increased its crude protein content about 1.5%. However, feedlot performance of heifers fed the Pro-Sil treated HMEC was no better than that of cattle fed the regular HMEC without urea supplementation in this short study. Further research is needed to determine the effectiveness of adding ammonia based silage additives such as Pro-Sil to HMEC under more optimum moisture levels in the silage.



High-moisture ground ear corn was mixed with Pro-Sil and ensiled in a Silopress bag for this study.

[1] Trial conducted at the James Valley Research and Extension Center, Redfield, South Dakota.

Feedlot performance of the British and exotic cross heifers was very similar in this study.

The Silopress bag was found to be a very satisfactory ensiling structure for HMEC.

Introduction

Pro-Sil, an ammonia-molasses-mineral suspension, has been shown to be a highly effective commercial additive for corn silage in studies at SDSU and other midwest universities. When added to corn silage at the time of ensiling, this product stimulates beneficial fermentation and increases the crude protein content of the silage, thereby reducing or eliminating the need for protein supplementation at the time of feeding.

While Pro-Sil has been thoroughly tested with whole plant corn silage, no research has been conducted with ensiled high-moisture ear corn (HMEC). Since the crude protein content of HMEC is low compared to the needs of feedlot cattle, research is needed to evaluate economical methods of boosting the level of this critical nutrient.

Thus, the major objective of this initial study was to compare the feedlot performance of cattle fed Pro-Sil treated HMEC or regular HMEC mixed with either a control or a urea-based protein supplement at the time of feeding. Both types of HMEC were ensiled in a plastic Silopress bag to examine the effectiveness of this storage method with HMEC.

The relative performance of exotic and British crossbred yearling heifers was also studied in this trial.

Procedures

Since a field harvester capable of direct chopping high-moisture ear corn was not available, snapped ear corn was harvested and stored at the station with an additional quantity purchased from a local producer. Approximately 40 tons of ear corn containing 20 to 24% moisture was finally obtained for the study. Once picking was complete, the ear corn was ground in a tub grinder, using a 1-inch screen, and conveyed directly to a large mixing wagon equipped with an electronic scale for recording load weights. Since the ear corn was too dry for direct ensiling, 20 gallons of water was added per ton to increase the final moisture content. About 60% of the high-moisture ground ear corn (HMEC) was ensiled directly after the water addition, while the remainder had Pro-Sil III added at the rate of 65 lb. per ton. This product, containing 85% crude protein, 1.2% sulfur and trace minerals, was applied over the top of each load in addition to the water. All loads were thoroughly mixed prior to ensiling. Samples of each load were taken before and after Pro-Sil and/or water addition.

The ground ear corn was ensiled in a 8-ml. thick, white, plastic "sausage" bag, 8 feet in diameter, using the Eberhardt Silopress ensiling system. The regular (untreated) HMEC was stored in one end of the bag with Pro-Sil treated HMEC stored in the other end. A 1-foot thick, chopped forage "buffer" was placed between the two types of ensiled HMEC. The bag was sealed shut until the start of the trial in June, 1979.

Seventy-two crossbred yearling heifers averaging about 700 lb. were purchased in May, 1979, from a reputation backgrounder in central South Dakota. The cattle were selected from a group of about 400 head on the basis of large frame size and breed background. One-half of the heifers were British cross (black baldies), while the other half were exotic crossbreds. The exotic crosses were further sorted by visual appraisal into Charolais-cross and Limousin cross groups. Eighteen head of each exotic breed group were obtained to gain some information on the value of the traditional practice of sorting feeder cattle according to color and apparent breed identity.

Upon arrival at the research feedlot, the cattle were backgrounded on chopped alfalfa-brome hay and whole oats. The level of oats was gradually increased to 10 lb. per head daily. Pro-Sil treated HMEC was slowly substituted for the oats during the last 12 days prior to the start of the trial. High level antibiotic (AS-700 crumbles) was fed for the first 3 weeks after arrival. In addition, the heifers were ear tagged, implanted with Synovex-H, 7-way vaccinated, poured with Warbex and dewormed with Tramisol injectable during the pretrial period.

The experiment was initiated on June 26, 1979. The heifers were uniformly allotted into six outside lots of 12 head each on the basis of breed group and shrunk body weight obtained after an 18-hour stand without feed and water. Three of the pens contained the black baldy heifers, while the other three pens each received six head of Charolais cross and six head of Limousin cross heifers.

Three basic rations were used in this study: (1) Pro-Sil treated HMEC fed with a control (low protein) supplement, (2) regular (untreated) HMEC fed with a urea-based protein supplement and (3) regular HMEC mixed with the control supplement. The latter ration served as the control to establish whether supplemental protein was indeed necessary for optimum cattle performance. All rations consisted of 96% HMEC and 4% supplement on an as fed basis. The supplements were gradually increased to the 4% level during the first 5 days of the trial. Chopped alfalfa-brome hay was used to get the cattle on a full feed of the respective HMEC and supplements, with the hay being slowly withdrawn during the first 8 days. Each ration was fed to one pen of black baldies and one pen of exotic cross heifers.

The supplements were custom mixed at the SDSU feed mill. The urea supplement contained 45% crude protein, while the control supplement contained only 7.6% (as fed basis). The urea supplement contained .65% added sulfur to maintain a nitrogen:sulfur ratio of about 10:1. Otherwise, both supplements contained 3.6% calcium, 4.9% salt, 9% molasses, 300 mg. Rumensin and 30,000 I.U. vitamin A per pound.

Results and Discussion

The comparative feedlot performance of yearling heifers fed Pro-Sil treated or regular (untreated) high-moisture ground ear corn (HMEC) is shown in table 1. The results in this table represent the average performance of one pen of black baldies and one pen of exotic cross heifers fed each of the three rations. The regular HMEC was fed with either a low protein, control supplement or a 45% urea-based protein supplement. Due to the limited amount of HMEC available, the trial lasted only 37 days.

Table 1. Comparison of Control, Urea Supplemented and Pro-Sil Treated Ensiled High-Moisture Ear Corn

Item	HMEC ration		
	Control	Urea supplement	Pro-Sil treated
No. heifers	2	24	24
Initial shrunk wt., lb.	743.0	742.0	739.6
Final shrunk wt., lb.	816.5	830.5	813.8
Avg. daily gain, lb.	1.99	2.39	2.00
Avg. daily ration, lb. (as fed)			
Ensiled HMEC	24.58	24.88	23.52
Supplement	1.03	1.04	.98
Hay	1.33	1.33	1.33
Total	26.94	27.25	25.83
Lb. feed/lb. gain (as fed)			
Ensiled HMEC	12.35	10.41	11.76
Supplement	.52	.44	.49
Hay	.67	.56	.66
Total	13.54	11.41	12.91

Supplementation of regular HMEC with urea boosted daily gains about 20% (1.99 vs. 2.39 lb.) and increased feed efficiency 15.7% compared with the control HMEC ration, demonstrating the need and substantial benefit of protein supplementation of HMEC. The urea supplemented HMEC ration contained about 11.4% crude protein, whereas the control ration averaged about 9.3% (dry basis).

Cattle fed the Pro-Sil treated HMEC performed no better than those fed the regular HMEC without urea supplement in terms of average daily gain and feed conversion. While daily consumption of the Pro-Sil treated HMEC was over 1 lb. per head less than the regular HMEC on an as fed basis, dry matter intakes were very similar due to an unanticipated difference in the moisture contents of the two types of ensiled HMEC. Analysis of the samples collected at ensiling time revealed that the Pro-Sil treated HMEC averaged 27.0% moisture, while the untreated HMEC contained 30.8%. This inadvertent difference in moisture contents may have changed the fermentation characteristics of the two types of ensiled HMEC and consequently altered their relative feeding values. Thus, additional research is necessary to closely evaluate the value of Pro-Sil as a nutrient additive for HMEC.

The average crude protein content of the control HMEC was 9.3%, while the Pro-Sil treated HMEC contained over 10.7% on a dry matter basis. Thus, the application of 65 lb. of Pro-Sil III per ton of HMEC increased the crude protein content of the ensiled material over 1.5%. However, this increase represents an apparent recovery of only about 50% of the crude protein (largely as ammonia) supplied by the Pro-Sil. Whether this recovery rate could be increased by direct application of Pro-Sil to HMEC at a more optimum moisture level needs to be determined.

Further research is currently under way to determine the fermentation characteristics, digestibility and overall feeding value of ensiled high-moisture ear and shelled corn treated with ammonia based silage additives in an attempt to find more economical ways of supplementing the protein needs of feedlot cattle with these feeds.

The relative feedlot performance of the two groups of crossbred yearling heifers, averaged across all three rations, is shown in table 2. Very little difference in average daily gain, feed intake or feed efficiency was noted between the black baldies and exotic cross heifers in this short study. It should be noted that both breed groups were selected for large frame size. There was also no material differences in daily gains of the two subgroups of exotic crossbreds with the Limousin cross heifers averaging 2.12 lb. and the Charolais cross heifers averaging 2.09 lb. per day.

The Silopress "sausage bag" was found to be a very useful and effective ensiling structure for high-moisture ground ear corn. The bags must be located on a clean, well drained site in order to minimize rodent problems and insure year-round access to the bags with mechanized feeding equipment. The ends should be kept tightly closed between feedings to minimize surface spoilage of the exposed silage. The HMEC was stored for over 8 months in the plastic bag without evidence of bag deterioration.

Table 2. Relative Feedlot Performance of British and Exotic Crossbred Yearling Heifers

Item	British cross	Exotic cross
No. heifers	36	36
Initial shrunk wt., lb.	723.7	759.4
Final shrunk wt., lb.	803.1	837.4
Avg. daily gain, lb.	2.15	2.11
Avg. daily ration, lb. (as fed)		
Ensiled HMEC	23.97	24.68
Supplement	1.00	1.03
Chopped hay	1.33	1.33
Total	26.30	27.04
Lb. feed/lb. gain (as fed)		
Ensiled HMEC	11.15	11.70
Supplement	.47	.49
Chopped hay	.62	.63
Total	12.24	12.82

EFFECT OF LENGTH OF FEEDING PERIOD ON PERFORMANCE OF BRITISH AND EXOTIC CROSSBRED YEARLING HEIFERS[1]

D. Whittington, G. Kuhl, A. Dittman and M. Esser
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Summary

Seventy-two heifers were fed for 47, 61 and 75 days to determine the optimum feeding period for exotic cross and black baldy heifers. Average daily gains and feed conversions of the heifers were similar among treatments. Carcass weight, quality grade and yield grade increased with time on feed. Fat thickness, quality grade and yield grade increased faster for the black baldy heifers. Cost per pound of gain was similar for all treatments.

The optimum weight at which to slaughter the black baldy yearling heifers appeared to be between 1000 and 1050 lb., both from a quality and economic view point. The optimum weight for slaughtering the exotic cross heifers was apparently not reached, as the last slaughter group was still gaining rapidly and efficiently with little increase in condition.

Large framed black baldies and exotic crosses were compared in this trial,

[1] Trial conducted at James Valley Research and Extension Center, Redfield, South Dakota.

The limited research conducted in this study indicates that a producer with mixed lots of cattle needs to be aware of the weight at which different types of cattle reach optimum condition. The feeder has greater flexibility in marketing the larger framed exotic cross type cattle as compared to the relatively smaller framed English breeds.

Procedure

The heifers used in the trial described in the preceding paper were allotted to six pens on the basis of shrunk body weight and previous treatment for a finishing period of 47, 61 or 75 days. Three pens were exotic cross cattle and three pens were black baldies. On each of the three slaughter dates one assigned pen each of exotic cross and black baldy heifers were taken to a commercial packing house and sold on a grade and yield basis. Carcass data were collected in the plant.

All of the heifers were fed the same ration consisting of 5 lb. of coarse ground barley, 1 lb. of the urea-based supplement described in the preceding experiment and a full feed of whole shelled corn. Heifers were gradually brought up to a full feed of this ration composed entirely of concentrates. The complete ration was carefully mixed and fed once daily. Sufficient ration was offered daily so that the heifers were never without feed. Ample quantities of fresh clean water and trace mineralized salt were available at all times.

Check weights were taken on all animals when a group went to slaughter to help monitor average daily gains. Only those animals being slaughtered were weighed again the next morning after an overnight stand without feed and water. This allowed us to calculate shrink which we could then apply to the other treatments and figure average daily gain on an estimated shrunk weight basis.

The economic comparison was made using the following values: feed = $3.20 per cwt.; carcass prices, choice grade 615 lb. and up = $1.02 per lb., choice 515 to 614 lb. = $1.01 per lb, good 615 lb. and up = $.96 per lb. and good 515 to 614 lb. = $.94 per pound. No values were assigned for purchasing and marketing costs, labor or yardage fees.

Results

The results of this study are summarized in table 1. Average daily gains were similar for the exotic cross and black baldy heifers in each slaughter group. The animals gained comparatively in all groups throughout the trial. The gains apparently had not peaked when the first group was slaughtered. Feed conversion ranged from 7.0 to 8.5 lb. of feed per pound of gain. The feed conversions were very similar for the exotic cross and black baldy groups slaughtered on the same day.

Differences in carcass weights (603.8 vs. 556.1) were greatest between the exotic cross and the black baldy heifers slaughtered in the 47-day slaughter group, which may have been more a function of the differences in initial weights of these groups as compared to slaughter groups two and three. The dressing percentage between these groups was also the greatest (61.8 vs. 60.1). The exotic cross cattle in the other slaughter groups had heavier carcasses, but the dressing percentages were almost identical at

Table 1. Comparison of Exotic Cross and Black Baldy Heifers Fed for 47, 61 and 75 Days

Slaughter group	1		2		3	
Breed cross	Exotic	British	Exotic	British	Exotic	British
No. days on feed	47	47	61	61	75	75
Avg. initial wt., lb.	857.8	806.1	845.8	816.8	843.2	810.9
Avg. final wt., lb.	976.5	924.3	1019.9	1001.7	1055.1	1020.8
Avg. daily gain, lb.	2.53	2.51	2.85	3.03	2.83	2.79
Avg. daily ration, lb. (as fed basis)						
Shelled corn	15.9	14.2	15.4	15.5	16.2	15.3
Ground barley	4.7	4.7	4.8	4.8	4.9	4.9
Supplement	1.0	1.0	1.0	1.0	1.0	1.0
Total	21.6	19.0	21.2	2.13	22.1	21.2
Lb. feed/lb. gain	8.5	7.9	7.4	7.0	7.8	7.6
Carcass characteristics						
Avg. carcass wt., lb.	603.8	556.1	614.7	604.2	636.7	616.8
Avg. dressing percent	61.8	60.2	60.3	60.3	60.3	60.4
Avg. fat thickness, in.	.31	.31	.34	.45	.37	.53
No. grading choice	8	7	8	11	7	10
No. grading good	4	5	4	1	5	2
Avg. yield grade	2.1	2.2	1.9	2.4	2.2	2.9
Economic comparison						
Avg. carcass value, $	595.74	545.44	614.70	606.71	633.52	622.97
Avg. price per lb., $	.99	.98	1.00	1.00	1.00	1.01
Total feed cost, $	32.59	30.24	41.61	41.96	53.50	51.34
Feed cost per lb. gain, cents	.27	.26	.24	.23	.25	.25

60.3%. The average fat thickness was the same (.31 inch) for the two groups which were slaughtered at 47 days. In the latter two slaughter groups the black baldy cattle were carrying a considerably higher degree of finish than the exotic cross heifers (.45 vs. .34 and .53 vs. .37 inch for the 61- and 75-day slaughter groups, respectively).

The number grading choice was about equal (8 vs. 7) for the exotic cross and the black baldy heifers in the first slaughter group. Thereafter, the black baldy heifers increased in the number grading choice and the exotic cross heifers remained the same. It appears that a longer feeding period would have been required to take the exotic cross heifers into a greater percentage of choice. The average yield grades of the exotic cross cattle did not exceed 2.2, indicating that these heifers could have been fed longer to attain a higher degree of finish without jeopardizing yield. However, the black baldy heifers in group three averaged a 2.9 yield grade, indicating that their weight and age were somewhat optimum for attaining a desirable grade and yield. The feeder should keep in mind that these black baldy heifers were long yearlings and were exceptionally grown out. Black baldies started on high concentrates at a younger age may not reach these weights without a lot of yield grade 4's.

As can be seen in table 1, carcass value increased with weight and grade. Cost per pound of gain was similar for all groups with the black baldy heifers showing a slight advantage.

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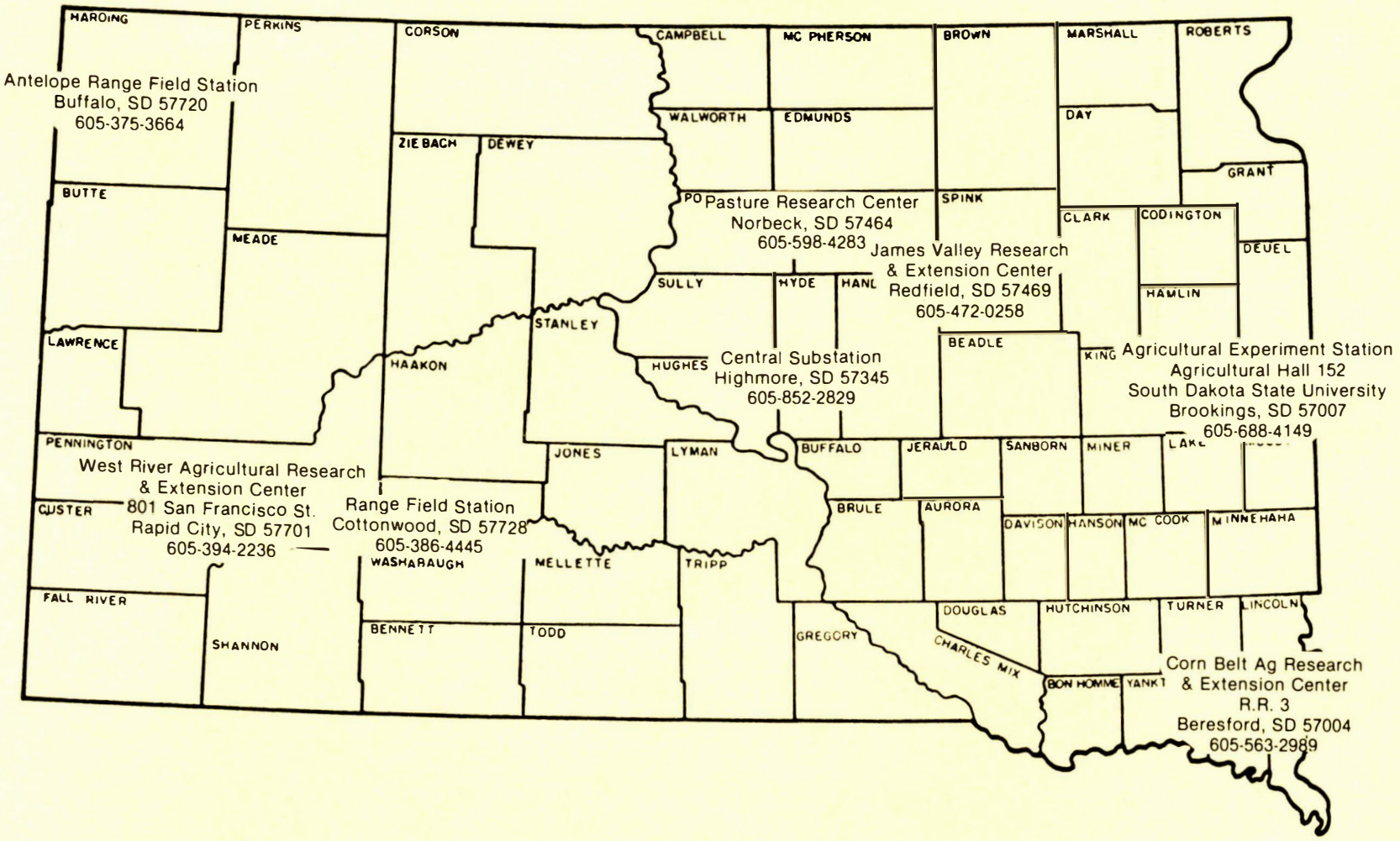

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