Beef Cattle Production and Management 1979 Progress Report

College of Agriculture
Agricultural Experiment Station
University of Missouri-Columbia

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Personnel

FORAGE

SYSTEMS

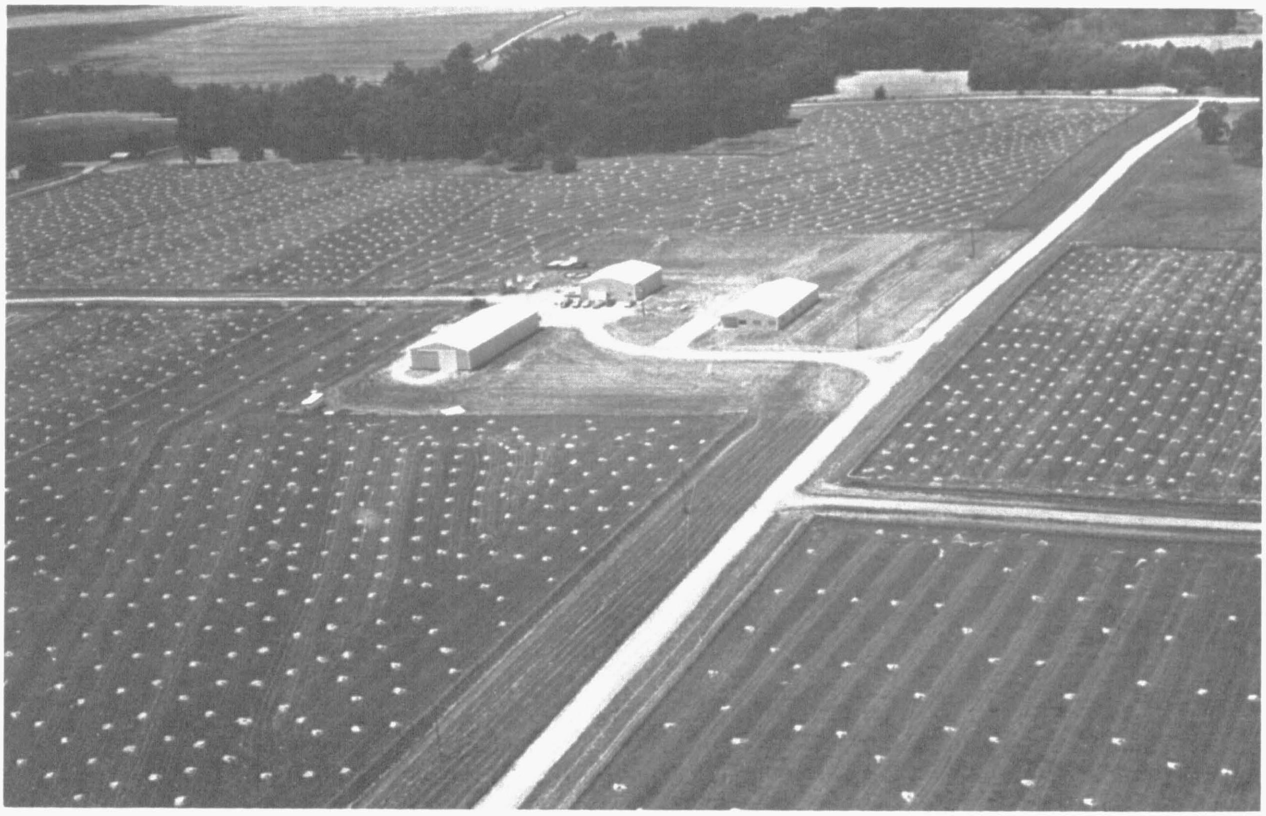
RESEARCH

CENTER

Linneus, Mo.

L-R, Jim Fitzgerald, farm worker; Nadine Henry; clerk typist; Dorance Devore, farm worker; Shannon Ogle, farm worker; Marvin Daniels; farm worker; Dennis Jacobs, herdsman; Floyd Jefferson, foreman; and Fern Artz, research assistant.

The Center



Agricultural Experiment Station — College of Agriculture

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FOREWARD

We are pleased to bring to you again this year a progress report on work at UMC relating to beef cattle. Several of these are articles on work being done and others are simply demonstration research; nonetheless, our objective is to present information that may be useful to the Missouri beef cattle producer.

Last year we highlighted the Animal Husbandry staff and the crew at the UMC Beef Cattle Farm (South Farms). This year we are presenting the staff at the Forage Systems Research Center (Cornett Farm) at Linneus, Missouri. The research at FSRC is performed by an interdisciplinary committee representing various departments in the College of Agriculture.

I would like to extend a welcome to and acquaint you with the following new staff members who will be involved in the beef cattle program either through research or teaching:

Dr. Dale Vogt - Breeding and Genetics
Dr. John Paterson - Postweaning Cattle Management
Dr. Tim Fairbrother - Superintendent, FSRC
Mr. Ross Hamilton - Judging Team Coach

We encourage you to visit our research centers and farms. If you would like to bring a group through or just visit by yourself, we would be pleased to show you our facilities and tell you about the work we are doing.

I personally feel we have great potential in the beef cattle research area in Missouri. With the new staff members and through good support we can develop a very effective program. We wish to express appreciation to the following organizations that have helped support some of the research covered in this report:

Elanco Products Company, Greenfield, IN
IMC Chemical Group, Inc., Terre Haute, IN
National Molasses Company, Willow Grove, PA
Missouri Beef Cattle Improvement Association
Shell Development Company, Modesto, CA
CIBA - Geigy Corporation, Des Moines, IA
Merck and Company, Rahway, NJ

Ron Morrow
Cow-Calf Management

EFFECT OF SUPPLEMENTAL FEEDING SPRING CALVING COWS FROM CALVING TO BREEDING SEASON

Ron Morrow, Jim Stricker and Dennis Jacobs

SUMMARY

Data from two years of supplementing spring calving Hereford cows from calving until going on two different forage systems were analyzed. The breeding performance of cows supplemented with grain was 91.4% versus 85.7% on the legume hay and 73.2% for the groups not supplemented. Approximately 81.4% of the cows on the fescue-red clover pastures settled compared to 86.9% of the ones on the fescue pastures fertilized with 100 lbs of nitrogen. Preliminary analysis of the calving data indicates that cows supplemented with grain calved earlier in the season than the other groups. This project will be carried out one more year.

INTRODUCTION

Considerable variation in number of cows settled has been experienced at the Forage Systems Research Center on fescue pasture fertilized at different levels of nitrogen with spring calving cows. There was also a significant difference in cows whose calves were creep fed versus non creep fed. The objective of this trial was to evaluate the effects of supplementing cows after calving, and the influence of forage systems during breeding season on conception rate.

PROCEDURE

This project was begun in the winter of 1977 and is in the third year. Hereford cows were carried through the winter in two groups. One group was fed hay from fescue pastures that had been overseeded with red clover and not fertilized with nitrogen. The other group received hay from fescue pastures fertilized with 100 lbs of nitrogen per acre. After calving the cows were continued on their respective forage system but divided into the following three supplement groups: 1) no supplement, 2) 2 lbs of grain per day (87.5% ground corn, 12.5% soybean oil meal), and 3) 3 lbs of legume hay (red clover in 1977, alfalfa in 1978). In mid-April of each year cows were turned on summer pastures as dictated by their previous forage type. The cows were carried in four breeding pastures with two bulls assigned to each group.

RESULTS

The breeding results for the first two years are shown in Table 1. Percentages of cows settled for two years were 73.2, 85.7, and 91.4 for the nonsupplemented, 3 lbs legume hay, and 2 lbs grain groups, respectively. With regard to the pasture systems the percentages were 81.4 and 86.9 on fescue-red clover and fescue + 100 lbs nitrogen, respectively.

The same trends were shown in both years for the supplemented groups but not for the two types of forages. In 1977 the cows on the straight fescue pastures had the highest conception rate and in 1978 there was no difference. It is felt that in 1977 the level of red clover was considerably lower than in 1978 and that forage availability rather than forage quality may have made the difference.

The conception rates for the supplement groups within a pasture system are not shown because a third year is needed to allow the data to be meaningful.

Table 1

Breeding Performance of Cows

	Number of Cows	% Settled
Fescue + Red Clover Pastures	86	81.4%
Fescue + 100# Nitrogen Pastures	84	86.9%
No Supplement	56	73.2%
2# Grain	56	91.4%
3# Legume Hay[1]	58	85.7%

[1]Red Clover Hay - 1977
Alfalfa Hay - 1978

EFFECTS OF SUPPLEMENTAL FEED LEVELS ON CONCEPTION RATES OF FALL CALVING COWS WINTERED ON FESCUE HAY

Jack Corbin, Dennis Jacobs, Ron Morrow and Jim Stricker

SUMMARY

Forty fall-calving Hereford cows were used to illustrate the effects of feeding grain during the breeding season on breeding performance. One group of cows was fed one pound of grain per head per day while the other group was fed four pounds. The conception rates were 55% and 80% for the two groups, respectively. The younger cows showed the greatest benefit from the high level of feed.

INTRODUCTION

The practice of feeding cows extra energy during breeding season (flushing) has shown mixed results. The results achieved can be dependent on several factors, such as condition of the cow and feeding program prior to calving and from calving to breeding season, forage quality and availability during breeding season, age of cow, milk production level, etc. Work at the Forage Systems Research Center (Cornett Farm) has shown better breeding performance of fall-calving cows than spring-calving on an all fescue program. One possible explanation for this was that fall-calving cows had good fall regrowth available after calving whereas the cows calving in the spring (late winter) had only hay and were not in as good condition entering breeding season. Results from another project showed increased conception rate with grain supplementation from calving to spring grass.

The objective of this trial was to demonstrate the possible influence of two levels of grain supplementation on the conception rate of fall-calving cows fed during the breeding season, after the decline in quality of fall regrowth.

PROCEDURE

Forty fall-calving Hereford cows were divided into two groups the first of November, 1977. One group received one pound of grain per head per day and the cows in the other group four pounds. The grain mixture was 87.5% corn and 12.5% soybean oil meal. Feeding began at the time the cows were divided and the breeding season was from November 16, 1977 to January 31, 1978. The cows were bred artificially with all semen from the same collection. Steers injected with testosterone and wearing chin ball markers were used to detect heat.

RESULTS

The influence of the two levels of grain is shown in Table 1. Of the 20 cows fed four pounds of grain, 17 were observed in estrus and 16 conceived as compared to 13 showing estrus and 11 pregnant in the one pound group.

A breakdown of the influence of the grain by age of the cow is shown in Table 2. Of the cows over three years of age, all in the high grain group and 9/13 in the low level group conceived. In the first and second calf heifers only 6/10 and 2/7 conceived for the high and low level groups, respectively. The performance of the calves during the breeding season was better for the high grain group (1.15 versus .98 lbs/hd/day). Also, calves in both groups from older dams gained about .25 lb per day better than calves from two or three-year-old dams.

This demonstration indicates that feeding grain during the breeding season for fall-calving cows can be beneficial, particularly in the case of first and second calf heifers. The high level in this study was great enough for the older cows but not the younger animals, even though they did gain weight whereas cows in the low level group all lost weight.

Table 1

Breeding Performance and Gain Data

	1 lb	4 lb
Number of cows	20	20
Number of cows showing estrus	13	17
Number of cows conceiving	11	16
Percentage of cows conceiving	55%	80%
Average days calving to conception	91.8	89.8
Weight gain during breeding season (lbs)	-41.0	+22.5
Average daily gain of calves (lbs)	.98	1.15

Table 2

Breeding Performance and Gain Data of Young Cows
Versus Older Cows in Each Group

	1 lb		4 lb	
	3 yrs or less	Over 3 yrs	3 yrs or less	Over 3 yrs
Number of cows	7	13	10	10
Number of cows showing estrus	3	10	7	10
Number of cows conceiving	2	9	6	10
Percentage of cows conceiving	30%	70%	60%	100%
Average daily gain of calves (lbs)	.83	1.08	1.02	1.27

USE OF LIQUID SUPPLEMENT IN WINTERING BEEF COWS AND CALVES

Li Marsden, Duane Sicht, David Bowman, Al Decker and Ron Morrow

SUMMARY

Fifty-eight fall-calving Angus and Simmental cows and calves were divided into four groups for a wintering trial on small round bales. Two groups of cows (pasture 1 and 4) had access to a liquid supplement. The other groups (pastures 2 and 3) received three pounds of grain per head per day. The grain was fed three times a week. The calves in pastures 1 and 2 had access to a 16% crude protein liquid supplement in a creep area. Calves in pastures 3 and 4 had a grain creep. There was no significant difference between groups in weight gains for the cows. The calves having access to liquid supplement gained signficantly less (1.80 lbs per day) than the calves having the grain creep (2.32 lbs). The grain creep calves consumed 4.75 lbs of feed per day and carried considerably more condition than the other calves, which averaged .85 lbs of lick per day. There was no difference in frame score of the calves. There was also no significant interaction for calf gains between cow supplement and calf creep.

INTRODUCTION

Winter feeding has become one of the largest expenses of a cow-calf operation. Many types of wintering systems are available to producers and one of the most recent is the use of a liquid supplement along with a source of forage. Forage systems that can be employed are small round bales, conventional bales, large hay bales and stockpiled forage. The purpose of this particular trial was to determine the usefulness of a liquid as a substitute for grain in wintering systems for cows and also as a creep feed for calves.

PROCEDURE

This trial at South Farm involved the use of 58 cows with calves, 12 of which were percentage Simmental and the remainder being purebred Angus. The trial began December 20, 1978 and ended March 26, 1979 for a duration of 96 days. The cows were wormed, weighed and sorted into four groups according to breed, age, sex of calf, age of calf, and weight. All four groups had access to mixed grass hay (in the form of small round bales) and were provided an adequate supply of hay throughout the study. The hay was baled in May and left in the field, each of which was 20 acres in size. The consumption of the bales was controlled by an electric fence. After the hay in each portion was cleaned up, the fence was moved to give cows access to a new section. Cows in pastures 1 and 2 cleaned up their round bales and were fed additional square bales until the end of the study. All cattle also had access to fresh water and free choice loose mineral mix compound of trace mineralized salt, dicalcium phosphate and magnesium oxide.

The four treatment groups were as follows: 1) cows having access to liquid supplement (lick) and calves also having access to the liquid supplement in a creep area, 2) cows receiving grain and the lick creep, 3) cows receiving grain and calves grain creep, and 4) cows having access to lick and calves the grain creep. The cows receiving grain were fed three times a week (Monday, Wednesday, Friday) at a rate to average three pounds of grain per head per day per week. The grain mixture was 89% corn and 11% soybean meal. The same liquid supplement (16% crude protein) was used in the beginning for both cows and calves, except the lick for the cows contained 1.5% phosphorus rather than .6%. Consumption by the cows was very high; therefore, a lick with a higher level of protein (32%) was substituted for the cows. This necessitated splitting the trial into two phases as shown in the results.

RESULTS

Descriptive statistics including weights and feed consumption are presented in Tables 1 and 2. The difference in consumption by the cows of the 32% protein supplement (2nd phase) versus the 16% (1st phase) is quite dramatic. The cows consumed 12 lbs per head per day of the 16% versus 2.8 lbs of the 32%. The calves consumed less than 1 lb of liquid supplement per day and the calves on the grain creep ate a little less than 5 lbs per head per day. The total gain for the calves was 167, 181, 228, and 218 lbs for the 96 days for groups 1-4, respectively. No attempt was made to sort out the economics of the two creep feeding programs because of variable price of feeder calves this spring, especially considering that the grain creep calves were carrying more condition as shown by the weight:height ratio.

The least squares means for ADG are presented in Tables 3 and 4. The important consideration for the cows is that there was no significant difference in overalll gain among the groups and that the final weight of the cows was slightly higher than the initial weight.

Cows in pasture 1 consumed the most lick and gained the least during the first phase of the trial. They were also the heaviest animals and carried the most condition. During the second phase the cows on lick lost the least which stands to reason since they had also gained the least.

There was a significant difference between the two groups of calves on lick creep and those on grain creep. The calves on the lick did not adjust to the creep as quickly as the grain calves, contributing to the greater difference (.7) between the two during the first phase as compared to the second phase (.42). One possibility is that the calves had trouble turning the wheel of the lick tank during the extremely cold weather.

Since there was quite a difference in initial weights of the four groups, a covariant analysis of the data was done to adjust for the initial weight differences. The magnitude of the differences between group means did not change. There also was not a significant interaction between type of supplement for the cow and type of creep for the calf in terms of calf gain.

Table 1

Mean Weights (lbs), Condition Estimates and Feed Consumption of Cows by Group

	Treatments			
	1	2	3	4
Cows	(Lick)	(Grain)	(Grain)	(Lick)
Initial weight	1141	1066	1085	1095
End of 1st phase	1179	1158	1152	1154
Final weight	1163	1080	1106	1121
Initial Wt:Ht ratio	23.6	22.0	22.9	22.7
Final Wt:Ht ratio	23.7	22.5	22.7	22.5
Liquid consumption (lbs)				
Phase 1 (34 days)	13.8			11.3
Phase 2 (62 days)	2.8			2.7

Table 2

Mean Weights, Condition Estimates and Feed Consumption of Calves by Group

Calves	1 (Lick)	2 (Lick)	3 (Grain)	4 (Grain)
Initial weight	277	244	284	306
End of 1st phase	336	324	376	400
Final weight	444	425	512	524
Total Gain	167	181	228	218
Final Wt:Ht ratio	11.3	11.0	12.6	12.8
Creep consumption (lb/head/day)	.75	.96	4.8	4.7

Table 3

Least Square Means[1] of Average Daily Gain (ADG) of Cows by Group and by Supplement

	Treatment					
	Lick			Grain		
	1	4	Lick	2	3	Grain
ADG - 1st phase (lbs)	1.11[a]	1.73[b]	1.42[a]	2.71[c]	1.98[b]	2.34[b]
ADG - 2nd phase (lbs)	-.25[a]	-.54[ab]	-.40[a]	-1.26[c]	-.74[b]	-1.00[b]
ADG - overall (lbs)	.23	.26	.25	.15	.22	.18

Table 4

Least Squares Means[1] of ADG of Calves by Group and by Creep Types

	Treatment			
	Lick		Grain	
	1	2	3	4
ADG - 1st phase (lbs)	1.73[a]	2.33[b]	2.70[b]	2.75[b]
	2.03[a]		2.73[b]	
ADG - 2nd phase (lbs)	1.72[a]	1.63[a]	2.19[b]	2.00[b]
	1.68[a]		2.10[b]	
ADG - overall (lbs)	1.73[a]	1.88[a]	2.37[b]	2.27[b]
	1.80[a]		2.32[b]	

[1]Means on the same line with same superscript are not significantly different ($P < .01$)

A DEMONSTRATION OF WORMING COWS AND USING A GROUND SOYBEAN HAY AS CREEP FEED WITH FALL CALVING COWS

Dennis Jacobs and Ron Morrow

SUMMARY

A demonstration trial of worming versus not worming cows in the fall as well as having two types of creep for the calves was conducted on 37 fall calving Hereford cows. Half of the calves were creep fed with a grain ration and the other group had access to a ground soybean hay plus molasses ration. The grain group outgained the hay group 1.57 to .75 lbs per head per day. Grain creep consumption averaged 7.3 lbs. There was no difference in weight loss of cows wormed or not wormed.

INTRODUCTION

Previous work at the Cornett Farm has shown that fall calves need a supplemental energy source during the winter, especially when cows are low in milk production. Also, results indicate that creep fed calves sometimes carry more condition than necessary, especially if they go on backgrounding systems in the spring. The primary objective of this study was to determine if a ground legume hay could be used as a creep feed to give calves good growth yet not be over-conditioned and limit performance on grass. A secondary objective in this study was to look at the difference in weight gain or loss during the winter of cows that had been wormed in the fall versus cows not wormed.

PROCEDURE

In November, 1978, 37 fall calving Hereford cows and calves were at the Forage Systems Research Center and were split into two groups for wintering. One half of each group of cows were wormed with Tramisol (injected). The calves in one group had access to a regular grain creep (Table 2) and the second group had ground soybean hay with molasses added as 20% of the ration. Each group of cows had fescue hay in the form of large round bales available _ad libitum_. The trial lasted 75 days.

RESULTS

The average daily gain (loss) for cows and calves are shown in Table 1. There was no difference in the weight loss of the cows that had been wormed as compared to the cows that had not (.99 lbs/day versus 1.03/day). It should be pointed out that the cows had all been wormed in the spring and had not been on overgrazed pastures during the summer, thus possibly reducing the potential worm load of the cows.

There was a highly significant difference in the performance of the two groups of calves. Calves on the grain creep gained 1.57 lbs per day while the calves on the ground hay gained only .75 lbs per day.

Since there was no control group (calves without any type of creep) for comparison, it cannot be said that the ground hay-molasses creep feed did or did not contribute to the gain of the calves. With the harshness of the winter it is felt that the ground hay should have included some grain in an attempt to get the calves to gain around a pound a day. With low milk producing fall calving cows that generally reach their peak at 75-90 days, some type of supplemental feeding is needed during the colder months.

Table 1

Average Daily Gains (Losses) of Treatment Groups

Group	ADG (lbs)	
Wormed Cows	-.99	
Control	-1.03	
Grain creep calves	1.57	
Feed consumption	7.3	lbs/hd/day
Ground hay creep calves	.75	
Feed consumption	2.9	lbs/hd/day

Table 2

Composition of Creep Feed

37% cracked shelled corn

15% soybean meal (44% protein)

10% bran (wheat)

27% crimped oats

5% cottonseed hulls

5% molasses

0.5% trace mineral salt

0.5% dicalcium phosphate

SPRING CALVES, FALL CALVES OR BOTH---
WHICH IS BEST? --- FOR ME?[1]

J. A. Stricker and V. E. Jacobs

SUMMARY

There is no "best" calving season for every farm. The "best" calving season for an individual farm is one that fits well with the overall management system for that farm. If income from the beef herd is the main source of income for the farm, then the calving season that will produce the highest net return per acre would be the logical choice. On the other hand, on farms with a sizable row crop acreage, calving in February and March when labor is available to look after the cows, before heavy field work begins, would be a good system. Calving in September and October on this farm would conflict with harvest operations.

Calving in the fall might be a better choice where the operator depends on off farm employment for most of his income because of more daylight hours in the evening to check cows and because of more favorable weather.

INTRODUCTION

Beef cows in Missouri are bred to calve mainly in two seasons of the year, "Spring" (February to May) and "Fall" (late August to December). Calves born during these periods usually exhibit higher growth rates than calves born during the hot summer months of June, July, and early August or the cold winter months of December and January. In North Central Missouri at the FSRC some of the highest growth rates were observed in calves born around the last week of February in the "Spring" season and the first week of September in the "Fall" season.

The spring calving season is most popular in Missouri. Weaning weights of spring calves are heavier than weaning weights of fall calves of the same age. Economic return from a beef cow-calf herd is dependent not only on calve weight but also on:

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[1]Data on which this study is based is from research designed by an interdisciplinary committee and conducted, under direction of the committee, at the University of Missouri's Forage Systems Research Center. Membership of the committee was: A. G. Matches, USDA, SEA and Professor of Agronomy; G. B. Thompson, formerly Professor of Animal Husbandry; V. E. Jacobs, Professor of Ag. Economics; F. A. Martz, Professor of Dairy Husbandry; H. N. Wheaton, Professor of Agronomy; H. D. Currence, Assoc. Professor of Ag. Engineering; and J. A. Stricker, Superintendent Forage Systems Research Center.

* Number of calves born per 100 cows bred

* Number of calves sold per 100 calves born

* Price received per pound of calf sold

Percent of cows in the herd that calve, breed back, and calve the next year is important because of the high investment cost in each cow plus feed consumed by the animal with no consequent production. The number of calves born that survive to be sold is important for reasons just stated. In addition, a barren cow may be detected and sold when her previous calf is weaned, reducing feed costs and receiving at least part of the investment in the cow. A cow that loses a calf at birth or soon after has incurred all the costs for producing the calf. Profit from a number of other cows will be eaten up by the cow that loses a calf. Finally, the value of a calf is the calf's weight multiplied by the price the calf brings.

Seasonal price patterns reflect seasonal forage production patterns in Missouri with highest calf prices just prior to the abundant forage, low-cost: high-gain period in spring and lowest seasonal prices just prior to the high-cost: low-gain period in winter. Results of research at the Forage Systems Research Center indicate percent calf crop, percent of calves born surviving to be sold, and seasonal price patterns[2] all favor fall calves. (Prices are relevant, of course, only when calves are sold.)

A decision to calve in spring, fall or in both spring and fall will depend on a number of considerations. The most important considerations will often be how well the beef herd fits labor patterns, cash flow, capital needs, etc. of other cropping and livestock operations on a specific farm. In a number of cases, how well the beef herd fits with off farm employment will be an important consideration. The beef herd should complement other crop and livestock operations as much as possible thus minimizing direct competition for feed, labor, and other resources. If the beef herd is the main source of income for the family, as in the case on some Missouri farms, management of the beef operation should be given the highest priority.

PROCEDURE

Performance of calves from four years of research with both spring and fall calving herds at the Forage Systems Research Center in North Central Missouri were compared. Calves in both herds were raised under the same management system; fescue-ladino clover pastures with no nitrogen and with 100 lbs of nitrogen per acre per year, and creep feed or no creep feed for calves.

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[2]Long term price trends associated with cattle numbers cycle and feed grain prices are sometimes stronger than the seasonal price trends as was evident in 1978 when cattle prices increased through the year because of a reduction in number of cattle coming to market.

A price index was developed based on calve weight and monthly feeder steer prices at Kansas City for years with a high steer/corn price ratio. A 320 lb calf, sold in November, was selected as the base for the index (index = 100).

Three fall systems are compared to spring calves weaned and sold in November. Fall systems include: fall calves weaned and sold in April, fall calves weaned and sold in early July, and fall calves weaned in July and grazed until November and then sold. Fall calves were creep fed only until mid-April. Creep fed July weaned fall calves did not receive creep feed from mid-April until weaned.

RESULTS

Conception rates were lower in the spring herd especially when nitrogen fertilizer was applied to the fescue-ladino clover pastures. Also, fewer calves survived to be sold in the spring herd. Higher death losses can be largely attributed to severe weather conditions often encountered in February and March. Cows in the spring herd were possibly deficient nutritionally from calving until spring grass in late April, which probably contributed to the poor reproductive performance.

Weather for calving was more favorable for the fall calving herd although a few calves were lost on extremely hot days in late August and early September when their mothers left them lying in the sun. Nutrition for the cow from calving to start of breeding in mid-November was excellent from the high quality fall regrowth of fescue. This, no doubt, contributed to the improved reproductive performance in the fall herd compared to the spring herd.

A calf index per acre is calculated in Table 1 for no nitrogen systems and in Table 2 for 100 lbs per acre nitrogen systems. The index provides a basis for making direct comparisons among the management systems being considered.

Table 1

Calf Value Index - No Nitrogen

	Cow-Calf Units/A	X	Conc. Rate	X	Survival Rate	X	Selling wt. (adj for age)	=	lbs calf/ acre	X	Price Index	=	Calf Value[b] Index per acre
Spring Calves[a]							(205 days)						
If sold in Nov.													
C_1	.43		.80		.85		410.08		119.91		.96		115.11
C_2	.42		.78		.85		458.26		127.61		.89		113.57
Fall Calves													
If sold in April													
C_1	.45		.79		.92		303.44		99.24		1.12		111.15
C_2	.44		.88		.92		397.64		141.65		1.04		147.32
							(280 days)						
If sold in July													
C_1	.42		.79		.92		416.93		127.27		1.02		129.81
C_2	.41		.88		.92		489.69		162.54		.97		157.67
							(400 days)						
Backgrounded and sold in Nov.													
C_1	.37		.79		.91		525.41		139.76		.91		127.18
C_2	.36		.88		.91		572.59		165.01		.89		146.91

[a]No charge has been made for creep feed. Feed conversion was 8.8 lbs of feed per pound of gain in the Spring herd and 10.9 lbs of feed per pound of gain in the Fall herd.

[b]If net calf price were $1.00 per pound then the calf value index would become gross income in dollars per acre.

Table 2

Calf Value Index - 100 lbs Nitrogen Per Acre[a]

	Cow-Calf Units/A	X	Conc. Rate	X	Survival Rate	X	Selling wt. (adj for age)	=	lbs calf/ acre	X	Price Index	=	Calf Value[c] Index per acre
<u>Spring Calves</u>[b]													
If sold in Nov.													
C	.53		56.6		.85		382.78		97.60		.97		94.67
C	.52		74.9		.85		428.95		142.01		.95		134.91
<u>Fall Calves</u>													
If sold in April													
C	.56		81.2		.92		303.28		126.87		1.12		142.09
C	.55		83.3		.92		389.02		163.97		1.04		170.53
If sold in July													
C	.51		81.2		.92		422.96		161.14		1.01		159.54
C	.50		83.3		.92		490.95		188.12		.97		182.48
If Backgrounded and sold in Nov.													
C	.45		81.2		.91		517.15		171.96		.91		156.48
C	.45		83.3		.91		573.42		195.60		.89		174.08

[a] Cost of 100 lbs of nitrogen plus other yield associated costs must be deducted from calf value index if calf values are to be compared with calf values from the no nitrogen system.

[b] No charge has been made for creep feed. Feed conversion was 9.8 lbs feed per pound gain in Spring herd and 10.5 lbs feed per pound gain in Fall herd.

[c] If net calf price were $1.00 per pound then the calf value index would become gross income in dollars per acre.

DEVELOPING REPLACEMENT HEIFERS ON THREE LEVELS OF ENERGY FROM WEANING TO BREEDING

Mike Linville, Ron Morrow, James Gubas, Al Decker, Duane Sicht, David Bowman and Bob Youngquist

SUMMARY

Seventy-two spring born heifers were fed through the winter on diets designed to furnish 80%, 100%, and 120% of the animals' requirements for a desired gain to reach breeding weight by mid-April. At that time all heifers were turned on a fescue-red clover pasture. Weight gains, height changes, pelvic growth, body composition estimates and ovarian activity are being monitored throughout the study.

INTRODUCTION

A primary problem for cow-calf producers is the development of replacement heifers. Much of the literature indicates that heifers should weigh around 650 pounds for British breeds and 750 for the European breeds before being bred. Also, weight is considered to be more important than age. With increased emphasis on frame in our cattle and selecting for more growth at later ages, a point to consider as well as age and weight is the condition of the animal with respect to the weight-age relationship.

The objective of this study was to evaluate the influence of body composition as well as weight and age on parameters of reproductive development. A secondary objective was to monitor the development of replacement heifers on an all forage diet after being fed different levels during the winter.

PROCEDURE

Seventy-two weaned Shorthorn, Simmental and Hereford heifers were assembled at the Beef Cattle Farm in November of 1978. The heifers were from three sources (Spickard, Cornett and South Farm) and had been on similar preweaning management. None of the heifers had been creep fed. The heifers were split into two size groups based on weight and frame. The heifers were then randomly allotted to three treatment groups. The groups were low, medium, and high energy rations, as designated by 80%, 100%, and 120% of the NRC recommended allowance to reach the desired breeding weight by 14 months of age. They were fed in six pens divided into light and heavy groups within the three treatment groups. The basal ration was orchard grass hay with varying levels of grain to achieve the desired nutritive allowance.

A steer injected with testosterone was put into each pen to help in checking heifers for estrus. The heifers were initially weighed, measured and "counted" through the ^{40}K counter to estimate body composition. Pelvic measurements were also taken. The heifers were weighed and pelvic measurements taken every 28 days, and rations were adjusted at that time.

The heifers were weighed off the treatment groups the middle of April and turned on fescue-red clover pasture. They were weighed, measured and counted at that time.

Breeding season began at the time the heifers were turned on pasture. They were bred artificially to Angus bulls. The heifers were "counted" when ovarian activity was detected through palpation and also when the heifers were bred.

RESULTS

The weight gains during the winter period and also on the fescue-red clover pastures are shown in Table 1. Also shown are the number of heifers that have been inseminated in each group after 50 days on pasture. These results are only preliminary. Looking at the gains of the light and heavy weight groups it can be seen why it is more efficient to feed replacement heifers in weight groups to achieve a desired rate of gain. Also illustrated is the compensatory gain effect of the low energy heifers after going on pasture and the negative effect of the high energy groups, particularly the light weight heifers. The number of heifers inseminated did not differ for the 100% and 120% groups but did for the low nutrition group.

Table 1

Mean Weights by Treatment Group

Weight Group	#	Ration Group	Initial Weights	On Pasture Weights	ADG	June Weight	ADG	# Bred
Heavy	12	120%	516	667	1.25	720	1.06	9
Heavy	12	100%	489	602	.94	640	.76	10
Heavy	12	80%	480	535	.45	574	.78	5
Light	12	120%	408	633	1.88	644	.22	7
Light	12	100%	392	565	1.44	596	.62	8
Light	12	80%	395	487	.77	527	.80	3

EFFECTS OF SUPPLEMENTING REPLACEMENT HEIFERS WITH EXTRA PHOSPHORUS PRIOR TO BREEDING

Ron Morrow, Vi Pflantz, Dennis Jacobs, Duane Sicht,
Al Decker and David Bowman

SUMMARY

Yearling heifers at two locations were free-fed extra phosphorus a short time period to determine any effects on reproduction. There were no differences in reproductive traits, but the heifers receiving additional phosphorus outgained the control groups .2 lbs per day.

INTRODUCTION

Phosphorus has been considered to be very important with respect to reproduction in the beef cow. Phosphorus is also known to be of low quantity in forages. A boost in conception rate has been observed when extra phosphorus was added to the ration of cows. Also, there has been speculation on the adequacy of feeding minerals free-choice. Some reports indicate cattle will consume only enough mineral free choice to prevent a deficiency, others indicate an overconsumption.

The purpose of this study was to determine if force feeding extra phosphorus prior to breeding of replacement heifers would have any effect on reproduction.

PROCEDURE

In the fall of 1977 25 Angus and Simmental heifers were divided into two groups and put on a ration of 15 lbs ground fescue hay and 3 lbs oats per head per day. The ration of one group also contained enough dicalcium phosphate to raise the phosphorus content to 200% of the requirement expressed by NRC. The heifers were fed this ration for six weeks, until the beginning of breeding season.

Another set of heifers was handled similarly at the Forage Systems Research Center. In January, 1978, 30 Hereford heifers were divided into two groups and fed fescue hay in large round bales plus 3.5 lbs of a grain supplement containing 89% oats and 11% molasses. The above ration constituted the control group while the ration for the other group contained enough dicalcium phosphate to raise the phosphorus content to 200% of the requirement. These heifers were fed until mid April. In each control group the ration supplied in excess of 120% of the phosphorus requirement. All animals had access to a mineral supplement free choice.

Heifers were palpated at the beginning and end of each trial. The heifers at South Farm were bred artificially in drylots and the heifers at FSRC bred on fescue pastures with bulls.

RESULTS

The greatest result obtained in this trial is that the heifers receiving added phosphorus in the ration rather than only through free choice feeding had a higher ADG than the control groups. At South Farm the heifers gained 1.77 and 2.07 lbs per day for the control and supplemented groups, respectively. The heifers at FSRC gained .89 and 1.06 on the control and supplemented diets, respectively. After the heifers at FSRC were turned on pasture the control group out gained the group that had been supplemented (.87 versus .67) to give the two groups of heifers the same ADG for the period from January through July.

The number of heifers showing estrus at South Farm was greater for the supplemented group (10/12 versus 8/13) but there was no difference in number of heifers conceiving or in date of conception between the groups. Apparently the additional phosphorus for a short period of time did not enhance reproduction, but it did increase gain.

PINKEYE - INVESTIGATION OF THE MORAXELLA BOVIS CARRIER STATE IN BREEDING COWS

Johnathan Weber, Lloyd Selby, Ron Morrow and Duane Sicht

SUMMARY

Any further Pinkeye control program must take into account the fact that *M. bovis* carrier cattle exist. Therefore, when introducing new cattle into a herd, suitable precautions must be taken to prevent the transmission of *M. bovis*, either from, or to, the introduced cattle. Isolation of the new cattle, and topical application of an antibiotic spray in the eye, should be considered.

INTRODUCTION

Infectious Bovine Keratoconjunctivitis, or Pinkeye, today remains one of the major disease problems with which the Missouri beef cattleman has to contend. The reason for this, is that prevention and control measures that are currently applied, are largely ineffective.

At the present time, attempted control of Pinkeye, focuses largely on the following:

1) Improved management and husbandry: Including attempts to decrease pasture irritation from tall weeds and fescue by early and frequent clipping of pastures, improved nutrient, mineral and trace element supplementation, and constant efforts to try and control face-flies during the summer months.

2) Vaccination: Where IBR conjunctivitis is a contributory cause of Pinkeye, vaccination of breeding cows and calves at weaning, can reduce the incidence of Pinkeye. However, the majority of Pinkeye outbreaks in Missouri, are associated with the bacterium, Moraxella bovis. Vaccination of cows and calves with a Moraxella bovis bacterin is recommended. This should be done twice, 2 weeks apart, before any cases of Pinkeye occur in the herd.

3) Treatment: Cattle treated in the early stages (swollen watering eye, with relatively small lesion on the cornea) show a good response. However, the treatment should be repeated twice daily (antibiotic spray or salve) for two days and affected cattle isolated from the herd.

As with any infectious disease, the question arises: where does the *M. bovis* come from each spring, with unfailing regularity? Face flies have been shown to be able to mechanically transmit the bacteria from infected to susceptible cattle, but this is only of importance in outbreaks once the *M. bovis* has become established in a herd, in mid and late summer.

This led us to our hypothesis: Cattle, and specifically breeding cows and bred heifers, can harbor *M. bovis* through the winter months, and thus act as resevoirs of infection. They will then be an immediate source of infection to their highly-susceptible newborn calves.

PROCEDURE

Three herds of cows at the University of Missouri South Farm were monitored over a twelve month period, for the presence of Moraxella bovis.

Eye swabs were taken in the winter of 1977, spring, summer, and fall of 1978, and the isolation of *M. bovis* was confirmed by biochemical and fluorescent antibody tests. There was a mild outbreak of Pinkeye in this herd in summer of 1977, but no cases of Pinkeye occurred during the sampling period.

RESULTS

The results are shown in Table 1. All isolates of *M. bovis* were confirmed by fluorescent microscopy. All the isolates were non-hemolytic *M. bovis*, the form that does not cause disease. However, it is felt that under certain conditions, this form of *M. bovis* may transform into the hemolytic type which causes Pinkeye.

Therefore, the fact that *M. bovis* was isolated from all herds, at each sampling, indicates that cattle can harbor the bacteria in their conjunctival sacs, and act as reservoirs of infection.

On further analysis of the carrier animals, the following facts emerged:

1. There was no significant difference in overall rate between different sampling periods.

2. There was no association between the presence of healed lesions in the eyes, and carrier status.

3. *M. bovis* was not isolated from the same cattle each time; instead, it would appear that the bacteria circulate at a low level (3.8% - 20%) in the herd, passing from one cow to another.

4. There was a significantly higher rate of carriers in herd H the younger cows and heifers, when compared to herd S and herd F.

5. There was no significant breed differences in the Aberdeen Angus, Charolais and Simmental cows in the three herds.

Table 1

Isolation of M. bovis from UMC South Farm

	Herd S		Herd F		Herd H		Overall	
	Pos - Total	%	Pos - Total	%	Pos - Total	%	Pos - Total	%
Dec 77	4 - 79	5%	3 - 64	4.6%	7 - 35	20%	14 - 178	7.8%
Mar 78	3 - 79	3.8%	4 - 64	6.3%	3 - 25	12%	10 - 168	6.0%
Jun 78	10 - 90	11%	4 - 66	6.0%	3 - 22	13.6%	17 - 178	9.6%
Oct 78	2 - 42	4.8%	8 - 92	8.7%	2 - 20	10%	12 - 154	7.8%

FLY CONTROL ON BEEF CATTLE

Robert Hall, Mark Foehse, Ron Morrow, Duane Sicht and Dennis Jacobs

INTRODUCTION

Adequate fly control on pastured beef cattle is a problem which confronts Missouri producers on an annual basis. The two species of principal importance in the state are Haematobia irritans (horn fly) and Musca autumnalis (face fly). Although many recommended chemicals and application techniques (dust bags, back rubbers and sprays) are generally effective against horn flies, satisfactory control of face flies is seldom obtained. Evaluation of new materials and application procedure is, therefore, important if Missouri cattlemen are to be insured of having the most current fly control facilities at their disposal.

PROCEDURE

During the 1978 summer fly season, several new materials and innovative application techniques were evaluated on beef cattle maintained at the University of Missouri South Farm and the Forage Systems Research Center, Linneus.

1. Ear tags and devices. Ear tags containing 13.7% (wt/wt) Rabon[R] (stirofos) insecticide were affixed to both ears of cattle on summer pasture. Assessment of treatment efficacy was made by counting the numbers of adult face and horn flies on the entire head and one side, respectively, of 10 animals selected at random on a weekly basis. Untreated herds located nearby served as controls and were assessed in a like manner.

A new ear device, patented by Roy Goodwin (Lancaster, MO), was evaluated in a manner similar to that outlined above. This device consisted of a small plastic bottle held to the ear by a flexible strap. A cotton wick protruded from the bottom and brushed against the animals' faces during normal feeding activity. The bottles were filled with 140 wt gear oil containing 1.0% dichlorvos (Vapona[R]) insecticide on a volume basis.

2. Oral larvicide. Rabon[R] (stirofos) 1.0% oral larvicide was provided free-choice in mineral to beef cattle on summer pasture. The compound was made available in salt boxes at the rate of 1 station per 16-30 head. Consumption records were maintained and allowed calculation of intake recorded as milligrams active ingredient/100 lbs. body weight/animal/day.

Efficiency of treatments for fly control was assessed by 1) sampling for fly larvae in the manure produced by treated and control animals, and 2) performing counts of adult flies affecting animals under the treatment and control regimens.

3. Experimental compound. A new compound, CGA-72662, was tested for antimetabolic activity against face and horn flies by 1) spraying fresh manure pats deposited on summer pasture and subsequently analyzing such pats for fly productivity, and 2) feeding experimental steers the material at the rate of 0.5 milligrams/kg body weight/day. In the latter regimen, six steers were involved in the test, with three receiving treated feed for a five-day period and the remaining three receiving untreated feed during the same time frame. After five days, the feeds of the two groups were reversed. Toxic activity in the resultant manure was gauged by collecting equivalent fecal samples and challenging these with known numbers of laboratory-reared fly eggs.

RESULTS

1. Ear tags and devices. Stirofos impregnated ear tags provided excellent control of horn flies under field conditions for a period of 12 weeks. The low-level of producer input for this type of control makes it an attractive alternative to conventional means of insecticide application. Face fly control with the ear tags proved irregular, and we could demonstrate no significant correlations between ear tag usage and subsequent cases of pinkeye in treated herds. The new ear device was not particularly effective after an initial period of several weeks. The loss rate on these devices was high, and specimens recovered from the field six weeks after treatment contained no insecticidal fluid. Retention of the stirofos ear tags was considered good.

2. Oral larvicide. Control of fly species in the manure of cattle treated with stirofos oral larvicide fluctuated with the amount of chemical consumed. When the average daily intake exceeded 50 mg/cwt/day, suppression of larval Diptera populations in the manure was evident. Such doses appeared to have little effect on gross population structures of beneficial insects. It is important that adult face fly numbers on treated cattle differed little from those on untreated herds, even when the two were separated by half a mile. This fact reinforces the necessity of an area-wide approach when the use of such oral larvicides is anticipated.

3. Experimental compound. The insect growth regulator, CGA-72662, proved effective against dung-breeding flies when applied to manure as a spray at a concentration of 0.1% and the rate of 1 gallon/100 square feet. In the present study, the principal dipterous species collected were *Ravinia querula* and R. lherminieri; however, no face or horn flies were

collected from any treated manure pats. This method of application was evaluated primarily for experimental purposes and is not anticipated to be practical in field usage.

Oral administration of CGA-72662 to beef cattle at the rate of 0.5 mg/kg/day produced effective control of flies breeding in the resultant manure. The effectiveness of the control was somewhat more erratic than that observed when similar doses were fed to chickens in an indoor facility; therefore, it is possible that sunlight, mositure, and other environmental conditions may influence the stability of the compound. None of the cattle receiving CGA-72662 in the diet showed overt symptoms of intoxication or other inimical effects.

OBSERVATIONS OF USING BEEFALO SEMEN IN A COMMERCIAL BEEF COW HERD

Larry Martin and Ron Morrow

SUMMARY

In this demonstration comparing the performance of Beefalo and Simmental cross cattle, the Beefaloes failed to excel in any area. Adjusted weaning weights favored the Simmental x calves. Performance during the backgrounding phase was very similar, but the Simmental x cattle out-gained the Beefaloes on full feed and yielded carcasses which were of significantly higher cutability. However, it should be mentioned that Beefalo x cattle have not been claimed to be high performers on predominately concentrate rations. There needs to be more research on the performance of Beefaloes on a high roughage diet for a longer period of time.

INTRODUCTION

A significant amount of interest has been raised by the introduction and promotion of Beefaloes in the past several years. A fullblood Beefalo is described as a mixture of 3/8 buffalo and 5/8 cattle. Claims have been made as to its ability to show superior performance when compared to the beef breeds of cattle especially on high roughage diets. This article is one producer's observations of using Beefalo semen in a commercial beef cow herd.

PROCEDURE

In 1976 semen was obtained from six pureblood Beefalo bulls. Approximately 50 spring calving crossbred cows were bred AI with this semen during a period of around 45 days, after which a percentage Simmental (1/2 Simmental, 1/4 Hereford, 1/2 Holstein) bull was used as a cleanup bull on these cows for another month. The calves from these matings, born in the spring of 1977, are the animals which comprise this study. These calves were weaned in November of 1977. They were wintered together and then weighed prior to entering what shall be called the backgrounding phase from February 21, 1978 to May 13, 1978. The time period thereafter up until November 20, 1978 is described as the finishing phase of this study.

RESULTS

Upon calving in the spring of 1977, the calves were tagged, the Simmental cross bull calves were castrated and the majority of the calves were weighed. There were no significant calving difficulties with either group as most of the 1/2 Beefalo calves weighed between 80 and 90 lbs, which was very close to the birth weights of the male calves out of the 1/2 Simmental bull.

Up to weaning these calves and their dams were run together without any separation due to sex or breed and no access to creep feed. At weaning, the 1/2 Beefalo bulls had an average adjusted 205-day weaning weight of 373 lbs while the steer calves out of the 1/2 Simmental bull averaged 423 lbs. The 1/2 Beefalo heifers averaged 333 lbs while the heifers out of the 1/2 Simmental had a mean adjusted 205-day weight of 410 lbs. Upon weaning in the fall these calves were all run together on crop residues (milo and soybean stubble) and fed average quality hay at slightly higher than maintenance levels. During this time period, the calves grew in skeleton but only made minimal increases in weight.

In early February, 1978 the Beefalo yearling bull calves were castrated with the exception of five which were retained as bulls for the purpose of comparing their performance to their steer mates. On February 21 the calves were weighed with all measurements being verified by University of Missouri personnel. At this time, animals were selected to be involved in the backgrounding and feedlot stages of the trial. The adjusted weaning weight ratios were figured within groups which were separated according to breed and sex. These average ratios calculated within groups were 100 for the six steers out of 1/2 Simmental bull, 104 for the six 1/2 Beefalo steers, 105 for the five 1/2 Beefalo bulls, 100 for the four heifers out of the 1/2 Simmental bull and 105 for the four 1/2 Beefalo heifers. Initial weights at the beginning of the backgrounding period (See Table 1) were in favor of the 1/2 Beefalo animals due to the age advantage they possessed over the percentage Simmental group. During the remainder of the winter all of the calves received hay at a slightly higher than maintenance level with supplementation of a couple pounds of grain per head per day. They were then placed on grass in the spring and had access to a self-feeder containing a salt concentrate ration that limited their comsumption to about 1% of their body weight.

On May 13, weights were taken which signaled the end of the backgrounding phase and beginning of the finishing phase. Over the next month the percentage of salt in the diet was gradually reduced at the same time that the supply of grass available became more sparse. The concentrate portion of this ration consisted of ground milo with soybean meal in addition to the vitamins and minerals needed as recommended by NRC. Also in the spring the heifers were taken to the University Vet Clinic and spayed to eliminate all bulling and chances for pregnancies. All of the heifers and steers received Ralgro implants every 90 to 120 days. Toward the end of June the entire group of animals were consuming an *ad libitum* milo based high concentrate ration balanced to NRC requirements which included Rumensin and nonprotein nitrogen in the form of urea. They also had access to a limited amount of roughage, predominately in the form of hay.

Final weights were taken on November 20 (See Table 2) prior to the animals going to slaughter at Diggs Packing Co. in Columbia or the Abattoir on the Columbia campus. Carcass data was then obtained after the carcasses had thoroughly chilled. The carcass results are displayed in Table 3.

Table 1

Mean Weights (lbs) for Backgounding Phase

Description	Number of Animals	Initial Wt. 2-21-78	Average Age 2-21-78	WDA[1] 2-21-78	Wt. 5-13-78	Wt. Gain 2-21 to 5-13	ADG[2] 2-21 to 5-13
Simmental Cross Steers	6	454	265	1.71	575	121	1.49
Beefalo Steers	6	516	318	1.62	636	120	1.48
Simmental Cross Heifers	4	398	260	1.53	456	58	0.72
Beefalo Heifers	4	477	326	1.46	534	59	0.73
Beefalo Bulls	5	506	317	1.60	639	133	1.64

[1]Weight per day of age

[2]Average daily gain

Table 2

Mean Weights (lbs) for Finishing Phase

Description	Final Wt 11/20/78	Average Age 11/20/78	WDA[1] 11/20/78	Wt Gain 5/13-11/20	ADG[2] 5/13-11/20
Simmental X Steers	1161	537	2.16	586	3.07
Beefalo Steers	1152	590	1.95	516	2.70
Simmental X Heifers	941	532	1.77	485	2.54
Beefalo Heifers	974	598	1.63	440	2.30
Beefalo Bulls	1194	589	2.03	555	2.91

[1]Weight per day of age

[2]Average daily gain

Table 3

Means for Carcass Traits by Group

	CW	BF	LEA	% KPH	FYG	Marbling	QG
Simmental X Steers	686	.34	13.4	2.6	2.3	Sm^{37}	Ch-
Beefalo Steers	660	.48	11.1	3.0	3.3	Sl^{82}	G+
Simmental X Heifers	523	.41	10.9	3.0	2.7	Sl^{90}	G+
Beefalo Heifers	564	.52	9.6	3.0	3.5	Sm^{07}	Ch-
Beefalo Bulls	684	.28	12.9	1.7	2.0	Tr^{84}	St+

PERFORMANCE OF CROSSBRED STEERS FED ON VARIOUS FORAGE SYSTEMS

Robb Pilkington, Jerry Lipsey, Harold Hedrick,
Ron Morrow, Jerry Matches and Duane Sicht

SUMMARY

An evaluation of forage systems was undertaken to determine the economics of pasture utilization when feeding beef cattle. Hereford x Angus steers (117 hd) were allocated into four feeding systems comprised of 13 treatments. System I consisted of steers full fed silage and corn to slaughter weights of 819, 931 and 1048 lbs, respectively. System II compared steers carried to slaughter weights of 890 lbs and 982 lbs on either fescue or fescue-red clover pastures with self-fed corn. System III incorporated pastures of fescue, fescue-red clover or fescue-birdsfoot trefoil to achieve slaughter weights of 709 lbs. These same pastures were utilized by System IV, but an additional 383 lbs gain was produced through full feeding silage and corn (slaughter weight of 1092 lbs). System I data indicates ADG ranges of 1.41-1.69 lbs with days on feed ranging from 257-349 days. In system II, pastures ADG's for fescue and fescue-red clover were 2.18 and 1.34, respectively with 113 days of pasture, 2.29 and 2.38 for pasture and corn, and 2.05 and 2.00 respectively overall. Days on pasture and corn were 157 and 161, respectively. Systems III and IV pasture ADG's indicate .70 for fescue and .99 for fescue-red clover and fescue-birdsfoot trefoil with 188 days on pasture. In system IV, fescue steers on silage had an ADG of 2.60 vs. 2.38 for fescue-red clover and fescue-birdsfoot trefoil steers. Overall (pasture & feedlot) ADG's were 1.59 (fescue) and 1.61 - fescue-red clover and fescue-birdsfoot trefoil with 344 days of feed. The kind of pasture had little or no influence on steer performance whether fed corn on pasture or finished off pasture.

INTRODUCTION

The production of cattle on forages and grasses has, in recent years, become an increasingly important area of consideration. Numerous factors leading to this alternative include the increased world demand for grain, the increased cost of harvesting, storing and feeding grain and the recent interest in the development of improved grasses and legumes. Because of these changes in beef production, it is becoming more evident that systems to increase forage beef production and efficiency are needed. The following is a list of the objectives for this project.

1. Evaluate pastures containing grass or a combination of grass; legume in terms of cattle gains and composition and to define plant-animal relationships.

2. Measure the rate, composition and efficiency of cattle gains using production systems which vary in the amount of total body weight gain produced on pasture, corn silage or corn grain.

3. Evaluate energy input requirements of seven beef production systems differing widely in the substitutions of replensihable energy requirements (photosynthesis source) and non replenishable energy requirements (fossil fuel, fertilizer) under differing price-cost relationships.

4. Determine if the beef produced under the above systems has the characteristics acceptable to the consumer and industry.

PROCEDURE

Four systems of 13 treatments for growing and finishing beef cattle from weaning to slaughter weight were selected to provide variation in grain inputs and non replenishable (fuels and fertilizer) energy inputs. Basic corn grain-corn silage systems commonly used in the corn belt are being compared to systems making optimal use of pasture and roughages utilizing legumes to reduce fertilizer requirements and harvesting with animals to decrease fossil fuel requirements. These systems we selected to study should provide a basis to determine the minimal amounts of grain needed to produce acceptable beef.

The cattle selected for this project are Hereford x Angus and reciprocal cross steers. They were chosen to represent a large supply of feeder cattle with the growth potential, slaughter size endpoint and meat quality which Missouri cattle feeders commonly produce. These steer calves are obtained from Missouri producers about mid-October weighing 400-500 lbs. We attempt to select steers as uniform in weight, frame and condition as possible. They are wormed, vaccinated, poured for warbles and lice, implanted, tagged, branded and analyzed for body composition with the ^{40}K Whole Body Counter. The steers are assigned to treatments by blocking so that the on test treatment group means for weight, frame and percent body fat are nearly equal.

The treatments are outlined in Table 1. Steers in treatments 1-3 go directly to the feedlot and receive an all-corn silage ration until they reach 800 lbs. Treatment I cattle are then slaughtered and treatment II and III are changed to a high energy finishing ration (*ad lib.* shelled corn + 10 lbs corn silage per head + prot supp). Treatment II and III steers are slaughtered at 950 and 1050 lbs, respectively. All the other systems are wintered together. About April 15, they go on to the grazing phase. The pasture variables are forage type (fescue, fescue-red clover and fescue-trefoil) and fertilization rates (fescue legume pastures receive no nitrogen).

After they have gained 100 lbs, steers pasturing at the UMC South Farm (fescue, and fescue-red clover), treatments IV, V, VI and VII are given access to ground corn (self feeder). Steers at the Bradford Agronomy Research Center (treatments VIII, IX, X, XI, XII and XIII) graze until September 15. Treatment VIII, IX and X cattle go to slaughter directly off pasture and treatment XI, XII and XIII cattle are moved to the UMC Feedlot. They are finished on the same high energy ration as treatments II and III.

All growth performance and carcass grade information is collected as well as feed intake data. Detailed pasture data is collected which includes stocking rates, and measurements of forage availability, quality and residue. Steaks and roasts are removed from carcasses produced in all systems and slaughter endpoints. Complete palatability studies are conducted with the steaks and roasts as well as evaluating storage and cooking characteristics.

RESULTS

Because only two of the three years have been completed, results on pasture systems only indicate trends since the gains are susceptible to seasonal variation.

Table 2 contains the performance data for steers full-fed silage and corn (System I). Differences in ADG and days on feed between years is attributed to differences in silage quality.

The performance of steers fed corn on pasture (System II) is represented in Table 3. All pastures reflected a compensatory gain when moved on to pasture after wintering and when corn was started. Figure 1 shows combined average pasture gains for both years. Compensatory gains are observed between day 170 and 200 and day 300 through 350. No difference in performance can be attributed to pasture.

Table 4 summarizes the performance of the steers in Systems III and IV. Lower average daily gains on pasture in System III compared to System II may be due to the length of grazing. In both years cattle on fescue pastures had significantly lower average daily gains than cattle on fescue: legume pastures. When the steers went into the dry lot (System IV), the type of pasture had no effect on performance. Figure II shows the combined average gain for Systems III and IV and the large compensatory gains observed between day 170 and 200 and between day 300 and 350.

Table 5 contains the combined yield grades and quality grades for both years. Note that the steers in treatments VIII, IX and X had significantly lower quality and yield grades. This tends to indicate the need for an added energy source when finishing steers on pasture.

Table 1. Production systems for forage fed beef study[a]

System	Trtmt	Phase	Location	Treatment description	Starting wt	Expected gain wt	Slaughter wt
I	1	finishing	UMC feedlot	corn silage + prot supp	400-500	300-400	800
	2	finishing	UMC feedlot	corn silage + prot supp	400-500	300-400	---
		finishing	UMC feedlot	shelled corn + corn silage + prot supp	800	150	950
	3	finishing	UMC feedlot	corn silage + prot supp	400-500	300-400	---
		finishing	UMC feedlot	shelled corn + corn silage + prot supp	800	250	1050
II	4A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	UMC South Farm	fescue pasture	550-650	100	---
		finishing	UMC South Farm	fescue pasture + ground corn	650-750	200-300	950
	4B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	UMC South Farm	fescue pasture	550-650	100	---
		finishing	UMC South Farm	fescue pasture + ground corn	650-750	300-350	1050
	5A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	UMC South Farm	fescue-red clover pasture	550-650	100	---
		finishing	UMC South Farm	fescue-red clover pasture + ground corn	650-750	200-300	950
	5B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	UMC South Farm	fescue-red clover pasture	550-650	100	---
		finishing	UMC South Farm	fescue-red clover pasture + ground corn	650-750	300-350	1050

Table 1. (continued)

System	Trtmt	Phase	Location	Treatment description	Starting wt	Expected gain wt	Slaughter wt
III	6A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	Bradford	fescue pasture	550-650	150-250	800
	6B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	Bradford	fescue-red clover pasture	550-650	150-250	800
	6C	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	Bradford	fescue-trefoil pasture	550-650	150-250	800
IV	7A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	Bradford	fescue pasture	550-650	150-250	---
		finishing	UMC Feedlot	shelled corn + corn silage + prot supp	700-800	250-350	1050
	7B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	Bradford	fescue-red clover pasture	550-650	150-250	---
		finishing	UMC Feedlot	shelled corn + corn silage + prot supp	700-800	250-350	1050
	7C	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
		grazing	Bradford	fescue-trefoil pasture	550-650	150-250	---
		finishing	UMC Feedlot	shelled corn + corn silage + prot supp	700-800	250-350	1050

[a]Each treatment includes 9 head per year.

Table 2

System I (Silage) Performance

	Yr 1			Yr 2		
TRTMT	GAIN	DAYS	ADG	GAIN	DAYS	ADG
1	374	257	1.46	338	196	1.72
2	477	318	1.50	425	247	1.72
3	613	349	1.76	559	303	1.84

Table 3

System II (Pasture + Corn) Performance

	PASTURE		P + CORN		OVERALL
TRTMT	GAIN	ADG	GAIN	ADG	ADG
Year 1					
4[a]	156	1.81 (86)	362	2.34 (155)	1.21
5[b]	151	1.76	357	2.37 (151)	1.24
6[a]	166	1.93	356	2.26 (158)	1.30
7[b]	176	2.05	418	2.41 (173)	1.28
Year 2					
4[a]	186	2.11 (88)	358	2.82 (127)	1.46
5[b]	209	2.38	340	2.68 (127)	1.48
6[a]	175	1.99	361	2.46 (147)	1.41
7[b]	188	2.14	390	2.65 (147)	1.50

Table 4

System III (Pasture) and System IV (Silage) Performance[1]

	TRTMT[2]	PASTURE GAIN	PASTURE ADG	SILAGE GAIN	SILAGE ADG	OVERALL ADG
Yr. 1	Fescue	144	.86 (167)	399	3.12 (128)	1.30
	F: RC	180	1.08	375	2.93	1.34
	F: BFT	204	1.22	349	2.73	1.30
Yr. 2	Fescue	121	.75 (162)	437	3.19 (137)	1.27
	F: RC	166	1.02	422	3.08	1.29
	F: BFT	172	1.06	420	3.07	1.31

[1]One-half of steers on pasture moved to UMC Feedlot.

[2]Average of three groups of six head per treatment.

Table 5

Quality and Yield Grades[1]

TRTMT	System	Quality Grade		Yield Grade
I	1	7.8	G-	2.3
	2	9.9	G+	2.6
	3	10.3	C-	3.2
	4	9.1	G+	3.3
II	5	9.5	G+	3.2
	6	9.7	G+	3.7
	7	10.1	C-	3.7
	8	4.9	Std-	1.7
III	9	5.7	Std^{o}	1.7
	10	5.5	Std^{o}	1.8
	11	10.0	C-	3.0
IV	12	9.7	G+	3.3
	13	9.5	G+	3.2

[1]Average of two years

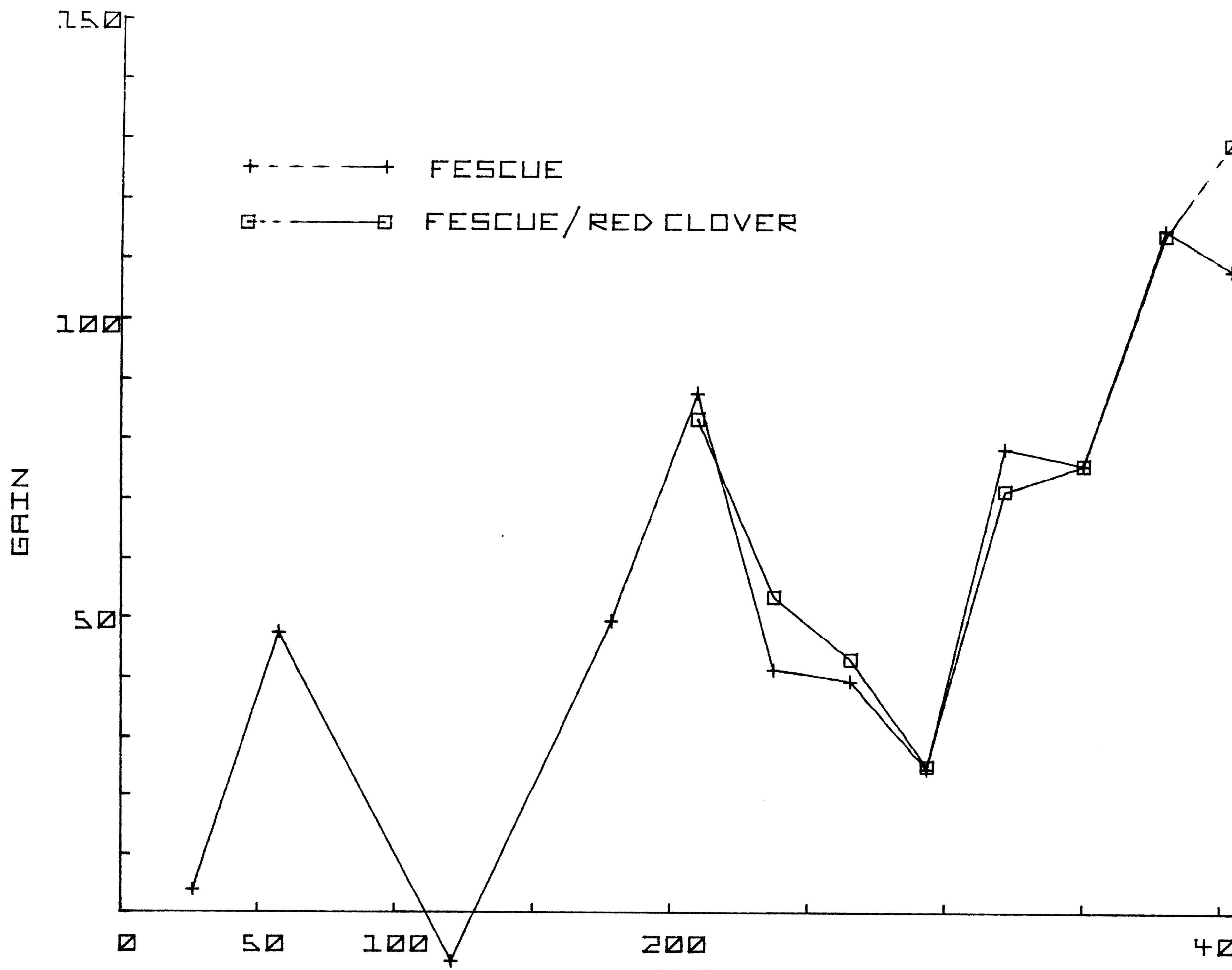
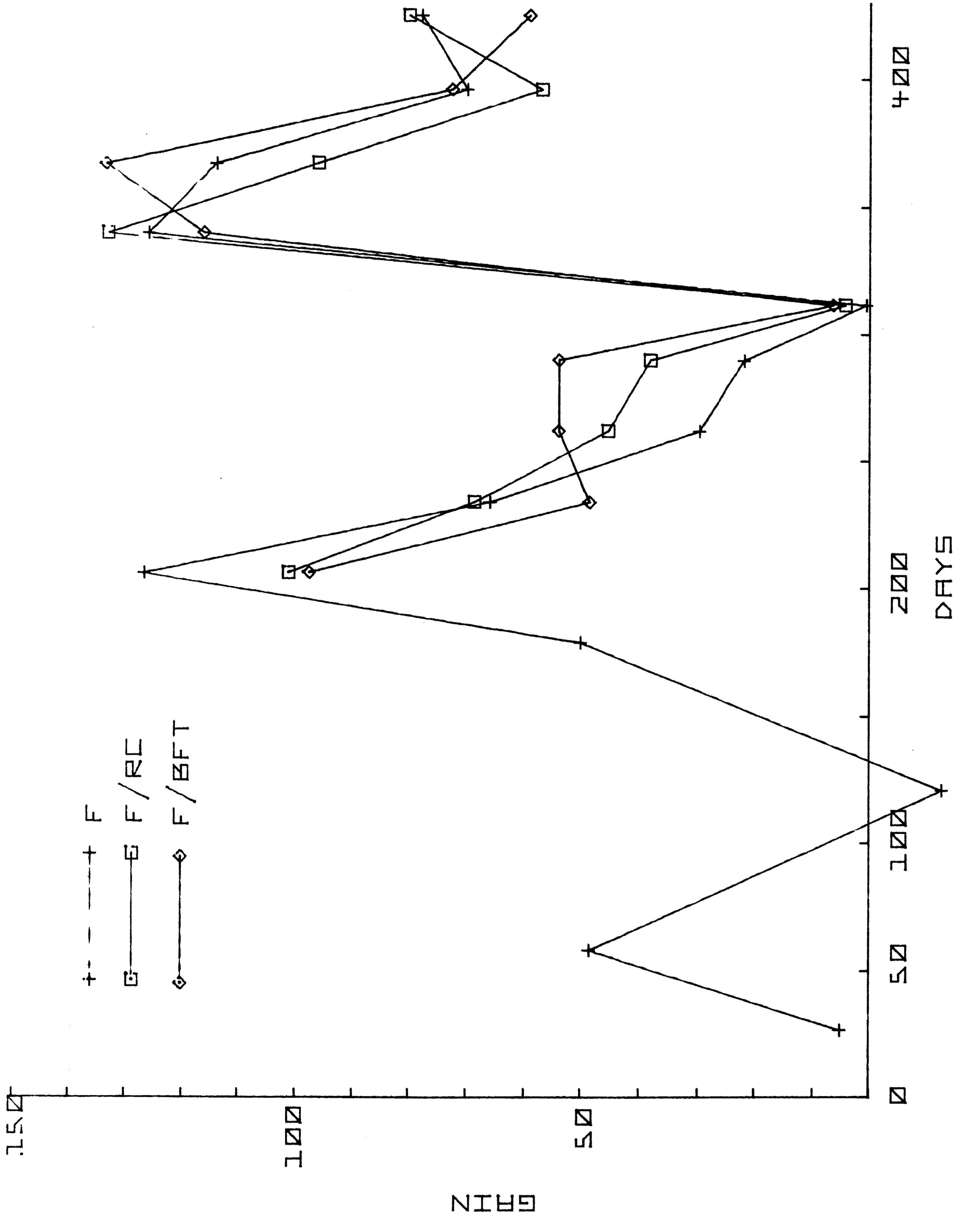


FIGURE 1

FIGURE 2



ENDOCRINE EFFECTS ON GROWTH RATE AND FEED EFFICIENCY

Joe Garrett, W. H. Pfander, Ron Morrow, David Bowman,
Alfred Decker and Duane Sicht

SUMMARY

Ten Angus and five Semmental weaning age bull calves were fed for a standard bull test period of 140 days, using a Pinpointer 4000, to determine if any relationship exists between circulating levels of thyroxine, triiodothyronine, insulin, and testosterone on growth rate and/or feed efficiency.

INTRODUCTION

Growth rate and feed efficiency are prime economic considerations in both the breeding herd and in the feedlot. Some data have indicated that a high correlation exists between rate of gain and feed efficiency in the feedlot. This pilot study was started to determine if such a correlation exists and if there are different circulating levels of thyroxine, triiodothyronine, insulin and testosterone in animals that have superior average daily gains and feed conversion ratios.

PROCEDURE

Ten Angus and five Simmental bull calves were taken from the UMC herd at weaning. They were wormed and placed on test. After fifty-six days on test, the calves were adapted to the new environment and were on full feed, the data collection was started. Blood samples were taken morning and afternoon, two days per week. The blood samples were analyzed for thyroxine, triiodothyronine, and insulin using 125^{I} and the Gamma Scintillation Spectrometer. The testosterone was analyzed using 3^{H} and the Beta Liquid Scintillation Counter.

The calves were weighed and fat free body percent was determined by the whole body (^{40}K) counter every twenty-eight days.

RESULTS

This study supports the previous research that indicates a high correlation between rate of gain and feed conversion ratios. The fifteen calves had a mean average daily gain (ADG) of 3.15 lbs and a mean feed conversion ratio (FCR) of 7.31:1. There were six calves over the mean average daily gain. Their ADG was 4.13 lbs with a FCR of 5.81:1. The nine calves below the mean ADG had a daily gain of 2.50 lbs and a FCR of 8.24:1 (Figure 1 & 2).

In this study, the whole body (^{40}K) counter data indicates very little change in body composition after being on test for eighty-four days (Figure 3).

At the time of this report, the statistical analysis of thyroxine, triiodothyronine, insulin, and testosterone has not been completed.

FIGURE 1

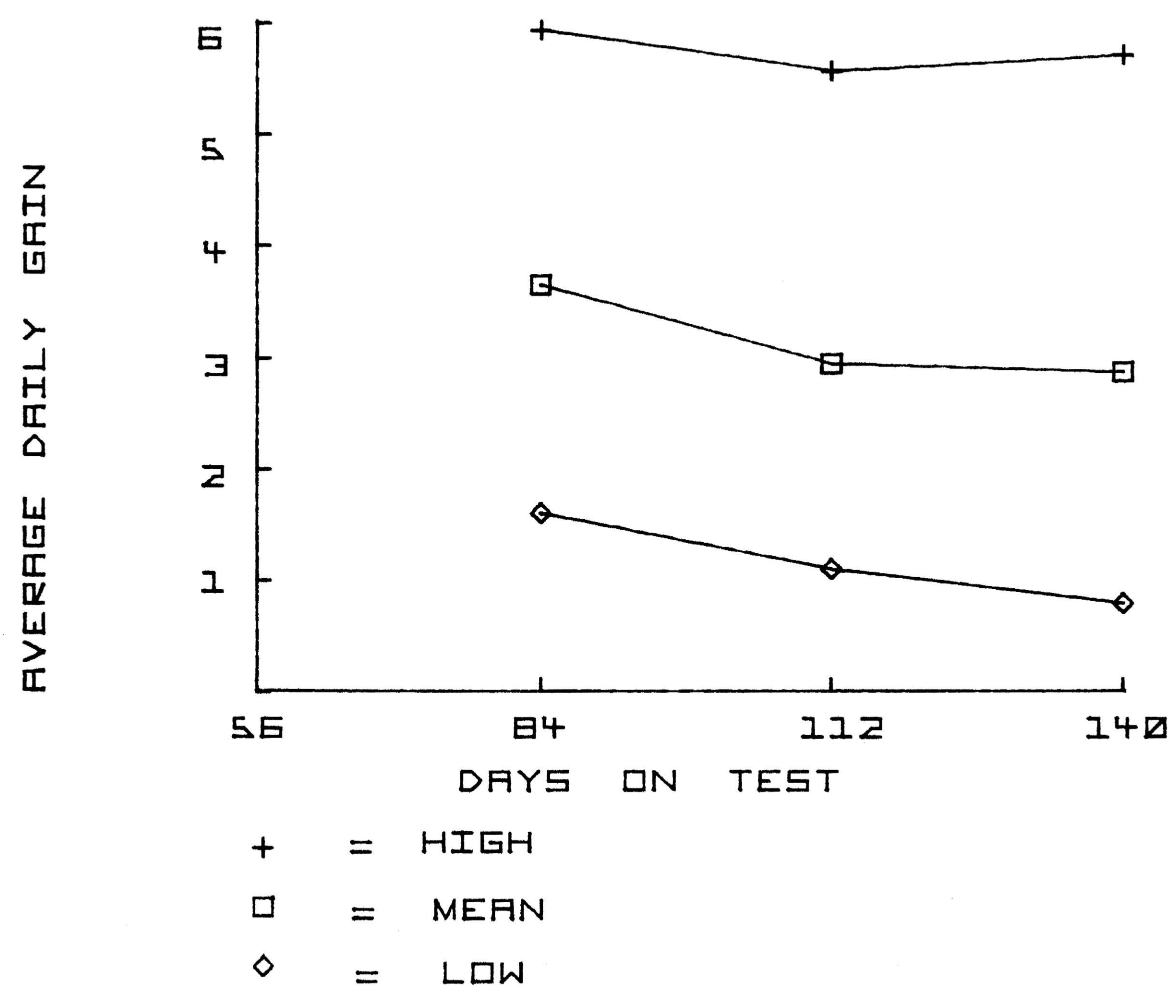


FIGURE 2

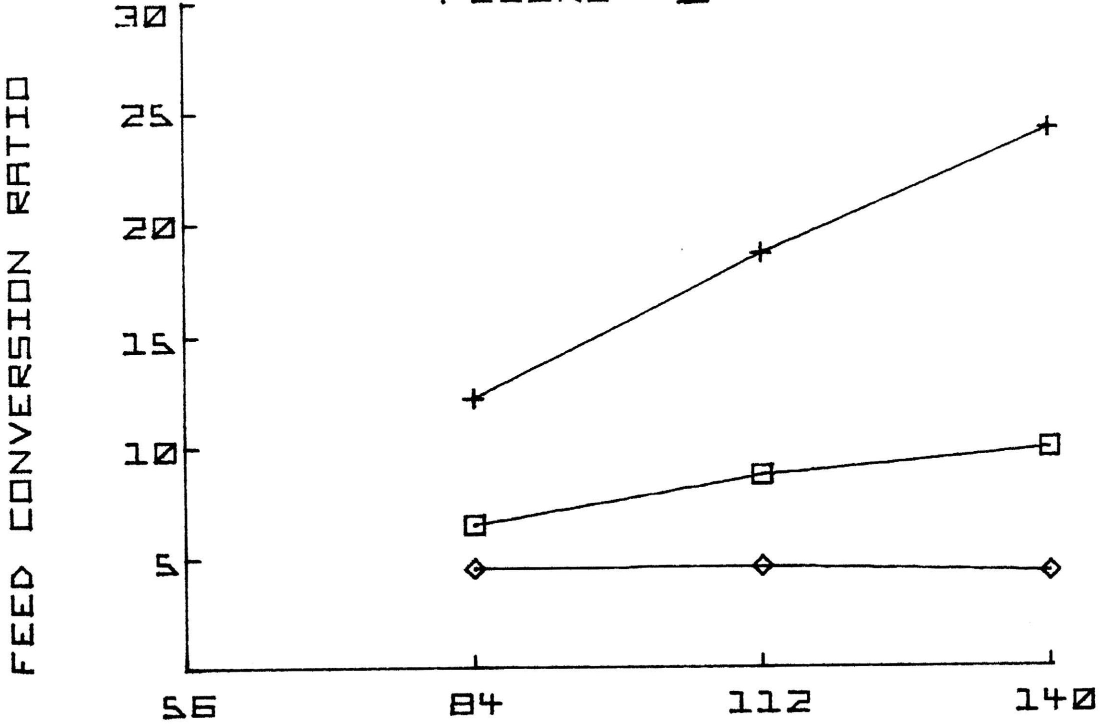


FIGURE 3

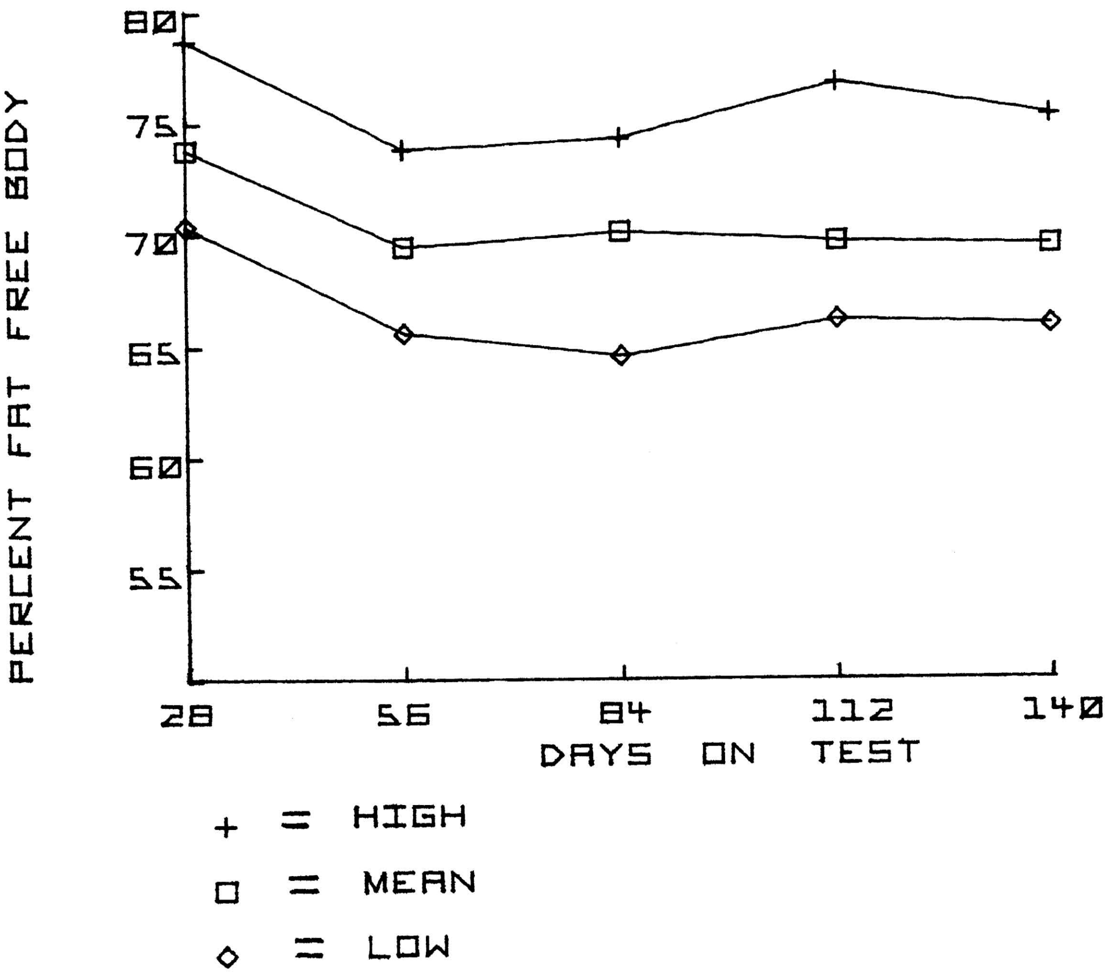


Table 1

Pinpointer No.	Bull Tatoo	Feed Intake 56-140 Day	Total Gain 56-140 Day	Feed Conversion Ratio 56-140 Day	ADG 56-140 Day	Fat Free Body %
1.	7625	1575	202	7.80	2.40	69.9
2.	7606	1847	236	7.83	2.81	68.2
3.	7638	1825	308	5.93	3.67	71.9
4.	7813	2210	426	5.19	5.07	71.7
5.	7824	1748	338	5.17	4.02	73.5
6.	7818	1878	316	5.94	3.76	68.7
7.	7617	1933	216	8.95	2.57	67.5
8.	7816	2306	396	5.82	4.71	71.6
9.	7814	1758	218	8.06	2.60	75.3
10.	7622	1686	192	8.78	2.29	68.1
11.	7614	1636	180	9.09	2.14	70.5
12.	7623	1847	256	7.21	3.05	65.9
13.	7615	2113	296	7.14	3.52	66.6
14.	7619	1994	216	9.23	2.57	66.2
15.	7629	1285	172	7.47	2.05	67.3
	Mean	1842.7	264.5	7.31	3.15	69.52
	S.D.	$\pm$256.5	$\pm$78.8	$\pm$1.41	$\pm$0.94	$\pm$2.82

Table 2

Pinpointer No.	Bull Tatoo	Feed Intake 56-84 Day	Total Gain 56-84 Day	Feed Conversion Ratio 56-84 Day	ADG 56-84 Day	Fat Free Body %
1.	7625	533	65	8.20	2.32	72.1
2.	7606	544	45	12.09	1.61	68.2
3.	7638	553	98	5.64	3.50	71.3
4.	7813	717	110	6.52	3.93	68.4
5.	7824	569	115	4.95	4.11	71.9
6.	7818	585	130	4.50	4.64	71.9
7.	7617	651	67	9.72	2.39	70.6
8.	7816	746	166	4.49	5.93	72.2
9.	7814	602	116	5.19	4.14	74.3
10.	7622	671	135	4.97	4.82	67.5
11.	7614	625	85	7.35	3.04	71.3
12.	7623	672	101	6.65	3.61	68.2
13.	7615	652	120	5.43	4.29	68.1
14.	7619	709	131	5.41	4.68	64.5
15.	7629	312	45	6.93	1.61	70.9
	Mean	609.4	101.9	6.54	3.64	70.09
	S.D.	±105.5	±34.8	±2.12	±1.24	±2.51

Table 3

Pinpointer No.	Bull Tatoo	Feed Intake 84-112 Day	Total Gain 84-112 Day	Feed Conversion Ratio 84-112 Day	ADG 84-112 Day	Fat Free Body %
1.	7625	502	83	6.05	2.96	70.7
2.	7606	601	109	5.51	3.89	66.3
3.	7638	573	80	7.16	2.86	73.0
4.	7813	717	156	4.60	5.57	70.9
5.	7824	583	85	6.86	3.04	73.3
6.	7818	626	100	6.26	3.57	70.8
7.	7617	618	63	9.81	2.25	67.0
8.	7816	730	136	5.37	4.86	73.0
9.	7814	624	80	7.80	2.86	76.8
10.	7622	579	31	18.68	1.11	66.3
11.	7614	502	41	12.24	1.46	67.6
12.	7623	578	59	9.80	2.11	66.9
13.	7615	707	90	7.86	3.21	66.2
14.	7619	625	35	17.86	1.25	68.8
15.	7629	430	85	5.06	3.04	68.0
	Mean	599.7	82.2	8.73	2.94	69.71
	S.D.	±82.1	±34.8	±4.39	±1.24	±3.24

Table 4

Pinpointer No.	Bull Tatoo	Feed Intake 112-140 Day	Total Gain 112-140 Day	Feed Conversion Ratio 112-140 Day	ADG 112-140 Day	Fat Free Body %
1.	7625	540	54	10.0	1.93	69.9
2.	7606	702	82	8.56	2.93	68.2
3.	7638	699	130	5.38	4.64	71.9
4.	7813	776	160	4.85	5.71	71.7
5.	7824	596	138	4.32	4.93	73.5
6.	7818	667	86	7.76	3.07	68.7
7.	7617	664	86	7.72	3.07	67.5
8.	7816	830	94	8.83	3.36	71.6
9.	7814	532	22	24.18	0.79	75.3
10.	7622	436	26	16.77	0.93	68.1
11.	7614	509	54	9.43	1.93	70.5
12.	7623	597	96	6.22	3.43	65.9
13.	7615	754	86	8.77	3.07	66.6
14.	7619	660	50	13.20	1.79	66.2
15.	7629	543	42	12.93	1.50	67.3
	Mean	633.7	80.4	9.93	2.87	69.52
	S.D.	$\pm$110.1	$\pm$40.4	$\pm$5.18	$\pm$1.44	$\pm$2.82

OBSERVATIONS ON VOLUNTARY FEED INTAKE OF CATTLE IN FEEDLOTS

Wayne Loch and W. H. Pfander

SUMMARY

Feed intake and other feedlot performance data were obtained from feedlots at Calexico, California; Hays, Dodge City and Garden City, Kansas. Monthly variations in feed intake were studied as was the effect of air temperature and average weight of the cattle during the feeding period.

Cattle started on feed in June at Calexico, California consumed less feed than those started in September for the first 12 weeks. After this time, a compensatory effect was observed and the cattle started in June increased rate of feed intake, while those started in September gradually declined. After about 30 weeks on feed, consumption was nearly equal.

The average dry matter intake per hundred pounds of body weight was found to decline as the average weight of cattle increased.

Cattle fed primarily during the fall and early winter months in Kansas apparently had a higher requirement for energy for maintenance and partially adjusted to this by consuming more feed.

An equation for predicting feed intake based on body weight of cattle and the percentage of concentrates in the diet was developed as follows:

$$\text{Intake} = 34.26568 - (\text{Wt kg} \times 0.01844) - (\text{conc} \times 0.066611)$$

Where
Intake = grams of feed per kg of body weight per day
Wt. kg = body weight in kilograms
Conc = percent concentrates in the diet

INTRODUCTION

The level of voluntary feed intake is recognized as one of the most important aspects of nutritional management in feeding cattle. Although predictions of feed intake are usually based on the body weight of cattle, other factors are believed to have an effect on the amount of feed consumed by cattle in the feedlot. The purpose of this study was to examine the effect of season, climate, sex and average feeding weight of cattle on voluntary feed intake. This information was then combined with data from other experiments to formulate an equation for predicting feed intake.

PROCEDURE

Feed intake and other data were obtained from four commercial feedlots in different locations. All of these lots were near a weather station and data were collected from them in order to study climatic effects on feed consumption. The diets fed at these feedlots contained approximately 86 percent concentrates.

RESULTS

Average feed intake on a daily basis for all cattle studied was approximately 2.6 lbs of air dry feed per 100 lbs of body weight. There was not significant difference between steers and heifers.

Cattle started on feed in January at Hays, Kansas ate less feed but gained faster than those started during September (Table 1). This supported the conclusion that those cattle entering the lot in September and fed primarily during the fall and early winter months had a higher energy requirement for maintenance and this was partially compensated for by consuming more feed.

A comparison of feed intake at various times throughout the feeding period was made between cattle started on feed in January and June, 1974 at Hartman and Williams Feedlot, Calexico, California. The results are shown in Figure 1. The cattle started in June consumed less feed than those started in January for the first 12 weeks on feed. After the 12th week, however, they ate more than those started in January. The end result was that total feed intake during the whole feeding period was about equal.

Calexico is located in the Imperial Valley of California, where the climate is extremely dry and very hot during the summer.

A model for predicting feed intake based on body weight of cattle and the percentage of concentrates in the diet was developed. Information based on the relationship of average body weight to feed intake obtained in this study was used. Also used were research data from the literature and results of lamb feeding trials conducted at the University of Missouri-Columbia by the authors of this paper. A multiple regression analysis was used to formulate the following equation:

$$\text{Daily intake} = 34.26568 - (\text{Wt kg} \times 0.01844) - (\text{conc} \times 0.066611)$$

Where

Daily Intake = dry matter as gms per kg of body weight
Wt. kg = body weight in kilograms and
Conc = percent concentrates in the diet

For convenience in use in the field, grams of intake per kilogram of body weight may be converted to pounds per 100 lbs of body weight by moving the decimal one place to the left.

Table 1

Feeding Performance of Cattle Started in September vs. Those Started in January - Hays Cattle Co., Hays, Kansas

Month Started on Feed	No. of Pens	Average Feed Intake (lbs)	Average Daily Gain	lbs Feed per lb Gain
September	17	27.06	2.35	9.15
January	21	25.01	2.64	8.88

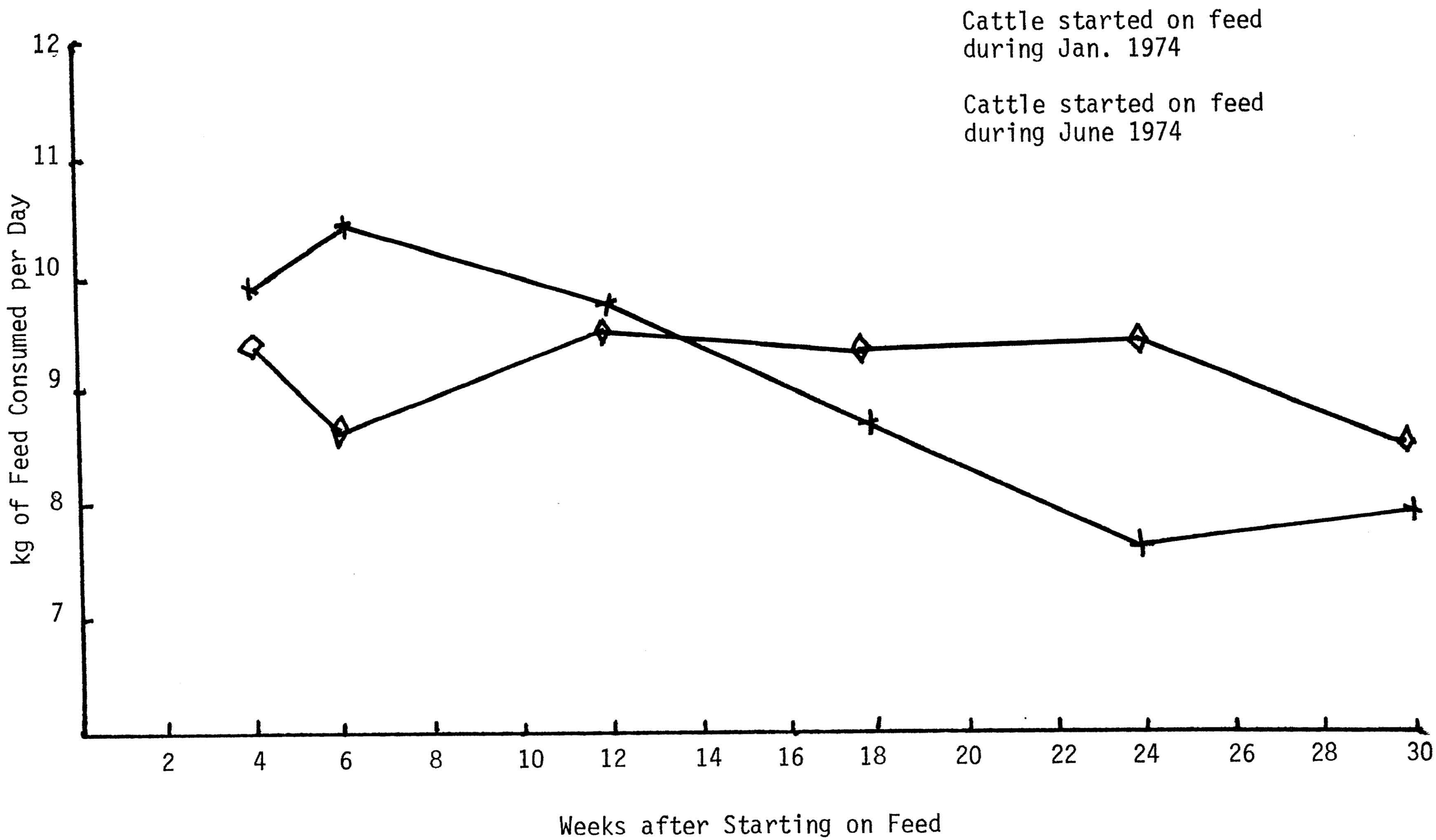


Figure 1. Feed intake by week for cattle started on feed in January and June 1974 at Hartman and Williams feedlot, Calexico, Calif.

RUMENSIN SUPPLEMENTATION: GRAZING STEERS AND FEEDLOT

Mark Stewart, Bud Reber and Jerry Lipsey

SUMMARY

Forty-eight steers were grazed 140 days at the North Missouri Center, where they were placed in the feedlot to evaluate their subsequent responses to Rumensin. We compared supplemental Rumensin to corn and to steers receiving no supplementation. In the feedlot we tested the effects of the pasture treatment on their feedlot performance. Rumensin in both phases of the trial increased ADG with an increased feed efficiency shown in the feedlot.

INTRODUCTION

Last spring Rumensin received FDA clearance for use with growing cattle on pasture. Previous work had indicated that grazing steers receiving Rumensin gained more weight and consequently were heavier at the end of grazing. We wanted to examine the performance of these heavier steers in the feedlot.

We have often observed reduced consumption (for 3-10 days) when cattle are started on a ration containing Rumensin. It was reasonable to assume the cattle receiving Rumensin on pasture would more readily consume the feedlot ration and subsequently have a superior performance.

PROCEDURES

We purchased 48 Angus and Angus X Herefords to graze fescue and orchard grass pastures from May 11 to September 28, 1978. The steers were randomly assigned to three treatments: Control, Corn Only, and Rumensin (Table 1). All steers went through the feedlot on the same ration; however, only one-half of each treatment received Rumensin (Table 2). The steers were in the feedlot from September 29, 1978 until March 1, 1979 with each group being finished to a constant weight endpoint.

RESULTS

During the pasture phase, the steers had an ADG of .93, 1.0, and 1.17 lbs for the Control, Corn Only, and Rumensin groups. In the feedlot the steers receiving Rumensin demonstrated both improved feed efficiency and higher ADG. Feed efficiency for the Rumensin and control groups were .17 and .15 lbs gain/lbs feed while ADG was increased from 2.85 lbs for the control to 3.09 lbs for the steers receiving Rumensin (see graphs 1-3).

When comparing pasture treatments to feedlot performance, the steers receiving Rumensin on pasture and in the feedlot had increased feed efficiency and higher ADG's than the five alternate treatments. This increase in ADG - 3.28 for the Rumensin - Rumensin, compared to 3.10 for the Control - Rumensin (Graph 3) may be attributed to an increased consumption during the first days in the feedlot (Graph 4). It is plausible to assume the steers supplemented with Rumensin on pasture were preconditioned to Rumensin. This then would account for the increased efficiency of the Rumensin - Rumensin steers in the feedlot.

We concluded that supplementing Rumensin on pasture can be an asset during times of favorable corn:livestock ratios. Feeders bringing Rumensin supplemented cattle into their lots will see an increase in early performance if they feed Rumensin. Feeders not feeding Rumensin will receive approximately the same performance with Rumensin supplemented cattle that they receive with cattle which have been fed grain on pasture (see Graph 4).

Table 1

Pasture Trial

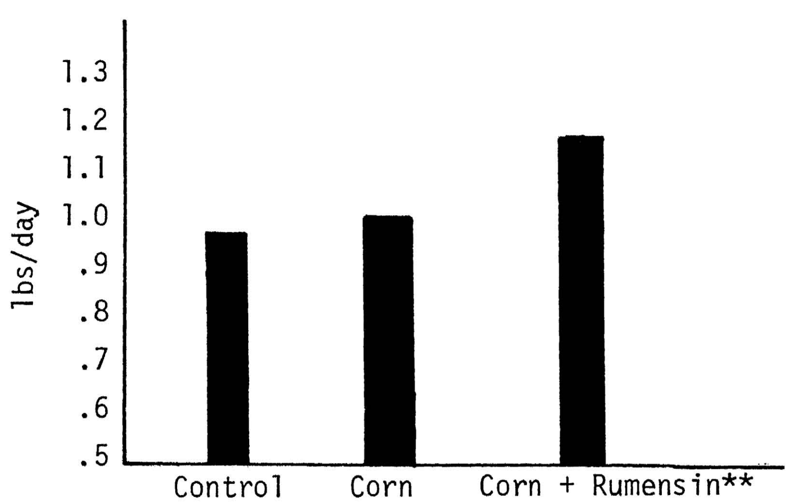
Group	Treatment	N	Reps
Control	0# Corn 0 mg Rum	8	2
Corn Only	2# Corn 0 mg Rum	8	2
Rumensin	2# Corn 200 mg Rum	8	2

Table 2

Feedlot Trial

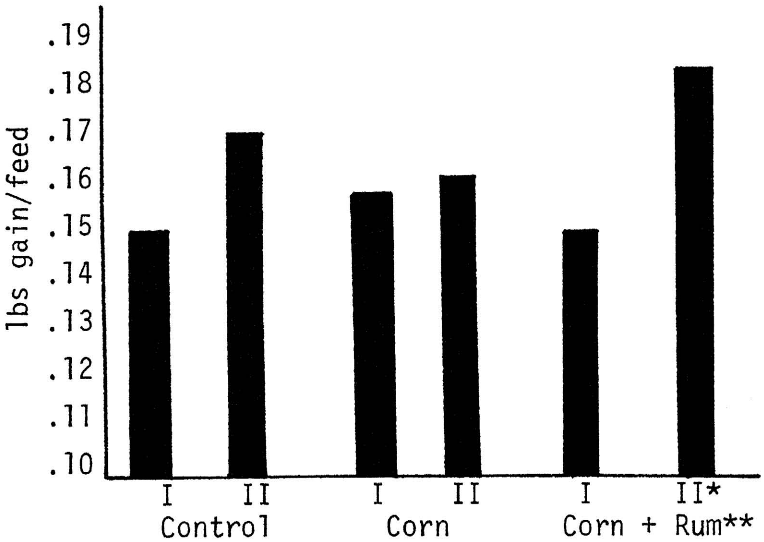
Pasture Group	Treatment	N	Reps
Control	1/2 Concentrate	4	2
	1/2 Concentrate + 300 mg Rum	4	2
Corn Only	1/2 Concentrate	4	2
	1/2 Concentrate + 300 mg Rum	4	2
Rumensin	1/2 Concentrate	4	2
	1/2 Concentrate + 300 mg Rum	4	2

Graph #1 Pasture ADG



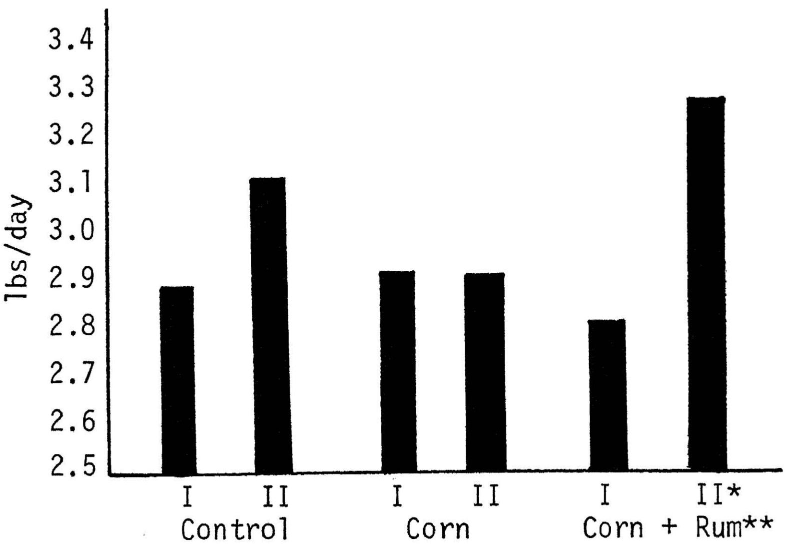
Graph #2

Feedlot Efficiency (gain/feed)

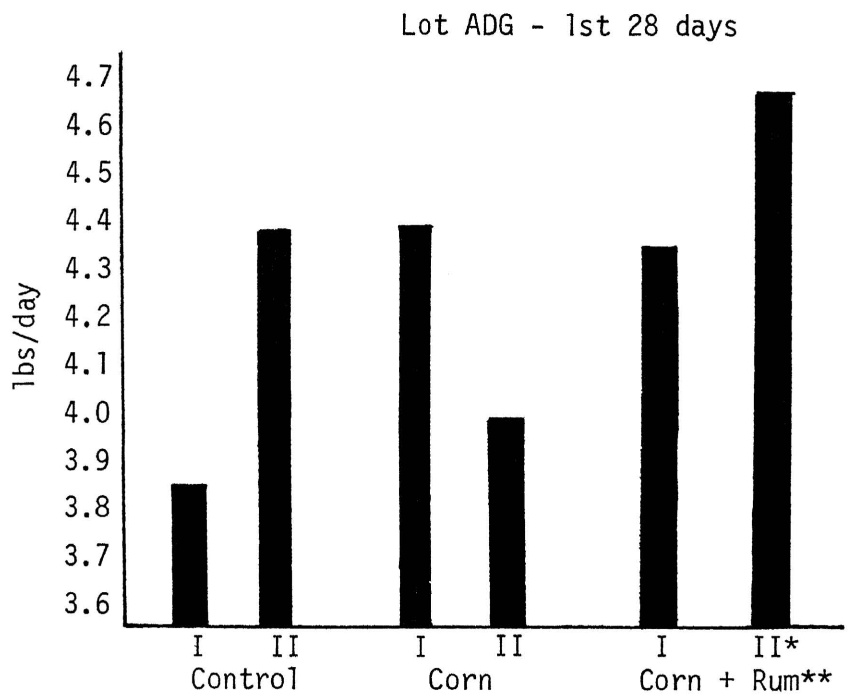


Graph #3

Lot ADG



Graph #4



*Feedlot treatments

I = no Rumensin
II = Rumensen at 30g/ton

**Pasture treatments

Corn received 2#/hd/day
Corn + Rumensin received 2#/hd/day and 200 mg Rum/hd/day

THIOPEPTIN FOR FINISHING CATTLE[a]

L. L. Wilson, J. Lipsey, E. Zellner and B. Reber

SUMMARY

Two high concentrate finishing trials were conducted with 160 yearling Hereford steers to determine the influence of Thiopeptin on growth, feed efficiency, carcass characteristics and incidence of liver abcesses of cattle under feedlot conditions. Although the inclusion Thiopeptin at 11 ppm in the ration did not significantly affect feedlot performance or carcass traits over the 126-day feeding period, it did result in improved feed efficiency and reduced feed cost per unit of gain. As a consequence, actual feed cost/cwt gain decreased by $1.16/cwt and $1.23/cwt in Trial I and II, respectively. The 28-day response data indicates that Thiopeptin may be particularly beneficial in reducing stress in animals abruptly switched to high concentrate rations.

INTRODUCTION

The possibility of lactic acidosis causes feeders to shift to high concentrate rations gradually. However, graduated amounts of high energy feeds cause real problems in feedlot management because of the number of rations involved. Management could be simplified and efficiency increased if one were able to shift immediately as desired to high concentrate rations.

Recent research has indicated that Thiopeptin, a sulfur containing peptide antibiotic, may be beneficial in controlling acidosis associated with abrupt ration changes to high energy diets. Thus a major objective of this study was to evaluate the feedlot performance and carcass characteristics of cattle feed high concentrate rations with and without Thiopeptin. The interrelationships of final roughage level and interval in days between ration changes were also compared.

PROCEDURE

One hundred and eighty yearling Hereford steers grazing wheat pasture and averaging approximately 650 lbs were purchased, and ninety head each delivered to University of Missouri research facilities at French Village or Spickard. The steers were immediately weighed, vaccinated, poured for lice and ear-tagged. Ten animals at each location were eliminated and the remaining 80 head were allotted to eight main treatments with two replications of five steers per treatment for a 126-day feeding period. This was followed by a 14-day drug withdrawal prior to slaughter.

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[a]This study was partially supported by Merck and Company, Rahway, New Jersey.

Identical procedures with the exception of roughage source were followed at each location. Treatments listing roughage sequence, days between ration changes and Thiopeptin level are given in Table 1. Ration compositions are given in Table 2. Roughage source varried between locations with cottonseed hulls serving as the primary roughage source at French Village, whereas corn silage was used at Spickard. Corn silage at ten percent of ration dry matter was assumed to be equivalent to five percent cottonseed hulls in roughage content.

Rations were fed once daily at levels which allowed free-choice consumption between feedings. Change from one roughage level to the next level was accomplished by an abrupt substitution (ad lib.) of the next highest concentrate level at the scheduled interval. This resulted in intake of the concentrate component alone increasing by as much as five fold (4 lbs to 20 lbs) within a 24 hour period. The cattle were weighed at monthly intervals throughout the trial with shrunk weights obtained at the beginning and end of the experimental period. Detailed carcass measurements were obtained at the conclusion of the trials.

RESULTS

The results of the 126-day trials investigating the impact of Thiopeptin on cattle performance are presented in Tables 3 and 4. No significant differences in cumulative daily gain after 126-days were noted in either trial due to Thiopeptin. However, a small improvement of 4.0 percent in feed efficiency was observed. Although not significant, this improvement was fairly consistent. The effect of Thiopeptin on feed consumption during the early feeding period was more pronounced. During the first 28 days of the study, feed intake averaged 10.4 percent greater on Thiopeptin containing diets.

Regardless of Thiopeptin level, cattle whose rations were changed at 12-day intervals were less efficient than those changed at 6-day intervals. Thiopeptin had no significant influence on carcass parameters including fat thickness, percent kidney fat, quality or yield grades.

No serious mortality problems developed with any of the cattle during the change from roughage to high-concentrate rations. However, the improved feed intake and performance observed during the first 28 days suggests that Thiopeptin may have reduced some of the subaccute stress associated with the abrupt changes.

TABLE 1. EXPERIMENTAL TREATMENTS USED TO EVALUATE THIOPEPTIN FOR FINISHING STEERS

Treatment Number	Ration Sequence Roughage (%)	Number of Days between Ration Changes	Thiopeptin, ppm
1	80-40-15	6	0
2	80-40-15	12	0
3	80-40-15	6	11
4	80-40-15	12	11
5	80-40-5	6	0
6	80-40-5	12	0
7	80-40-5	6	11
8	80-40-5	12	11

TABLE 2. COMPOSITION OF RATIONS

Ingredient	Roughage, %			
	80	40	15	5
Trial I (French Village)				
Hay	20	--	--	--
Cotton seed hulls	60	40	15	5
Corn[a] (cracked)	--	40	70	80
Supplement[b]	20	20	15	15
Trial II (Spickard)				
Hay	70	--	--	--
Corn silage	28	80	30	10
Corn[a] (cracked)	--	--	55	75
Supplement[b]	2	20	15	15

[a]Drug premix was added at the rate of 0.29% at the expense of cracked corn.

[b]Supplements were designed to meet NRC Nutrient Requirements for the total ration.

TABLE 3

Summary of Performance Data for Steers Fed Thiopeptin for 126 days

Variable		Treatment							
	Final Roughage %:	15				15			
	Days Between Ration Changes:	6		12		6		12	
	Thiopeptin ppm:	0	11	0	11	0	11	0	11
Trial 1									
Initial Wt., lbs.[1]		648.0	640.5	648.5	638.0	638.0	650.5	649.5	646.0
Final Wt., lbs.[1]		1031.6	1029.7	1016.2	1043.0	1010.4	997.1	1010.8	981.7
Average Daily Gain[1]		2.83	2.87	2.69	2.99	2.61	2.57	2.67	2.50
Feed Intake, lbs.[2]		20.54	19.22	20.22	20.55	16.71	16.85	18.10	17.03
Feed/Gain[2]		7.26	6.71	7.52	6.78	6.41	6.59	6.78	6.84
Cost/cwt gain		$38.15	$39.07	$35.02	$35.64	$34.05	$35.81	$35.28	$36.33
Trial 2									
Initial Wt., lbs.[1]		673.2	674.7	674.7	679.6	670.2	671.2	671.3	676.5
Final Wt., lbs.[1]		956.8	970.3	958.0	979.7	996.4	1000.6	957.7	977.0
Average Daily Gain[1]		2.27	2.39	2.15	2.40	2.57	2.57	2.31	2.47
Feed Intake, lbs.[2]		18.19	18.36	18.29	18.41	16.20	16.96	16.36	17.06
Feed/Gain[2]		8.00	7.67	8.49	7.66	6.35	6.62	7.08	6.83
Cost/cwt gain		$41.50	$39.89	$43.30	$38.69	$33.90	$35.31	$35.92	$35.84

[1] Based on shrunk wt

[2] Dry matter basis

TABLE 4. 126 DAY PERFORMANCE SUMMARIZED BY CHANGEOVER INTERVAL, ROUGHAGE LEVEL AND THIOPEPTIN LEVEL

	Average Daily Gain	Feed Efficiency	Cost/ Cwt
Trial 1			
Final Roughage, %			
15%	2.84	7.09	$37.02
5%	2.58	6.65	$35.37
Days Between Ration Changes			
12 Day	2.71	7.00	$36.71
6 Day	2.71	6.74	$35.67
Thiopeptin			
Control	2.70	6.99	$36.77
Thiopeptin	2.73	6.75	$35.61
Trial 2			
Final Roughage, %			
15%	2.30	7.96	$40.85
5%	2.48	6.72	$35.24
Days Between Ration Changes			
12 Day	2.33	7.54	$38.44
6 Day	2.45	7.16	$37.65
Thiopeptin			
Control	2.33	7.48	$38.66
Thiopeptin	2.46	7.20	$37.43

ENERGY IS ESSENTIAL FOR OPTIMUM POULTRY MANURE NITROGEN UTILIZATION BY THE RUMINANT

Victor Arvat and J. M. Vandepopuliere

SUMMARY

A digestion trial was conducted with lambs to evaluate the effect of a readily available energy source on nitrogen (N) retention of ensiled cage-layer manure (PW). Fresh PW from layers consuming a corn-soybean meal diet (PWA) and a grain by-product diet (PWB) was evaluated. Silages were prepared by mixing 22.7% PWA or PWB with 15.9% ground corn, 15.9% ground fescue hay, 0.1% salt and 35.4% water. Energy variables were produced by adding 10% wood shavings, 5% wood shavings and 5% corn starch, or 10% corn starch. The mixes were ensiled anaerobically in plastic lined cardboard drums. A pH range of 4.1 to 4.4 indicated fermentation was satisfactory.

Nitrogen and energy retention, for PW silage, increased as the level of readily available energy increased.

INTRODUCTION

In a previous experiment at UMC forty-eight lambs were used to compare the nutritional value of two types of ensiled fresh manure PW from caged layers. The evaluation of the apparent nitrogen digestibility and urinary nitrogen excretion indicated that the nitrogen of the PW silages, although absorbed, was not fully utilized. The failure to utilize the nitrogen may have been due to a low energy intake and retention.

This experiment was designed to study the effect of dietary energy on the retention of nitrogen from ensiled cage-layer manure.

PROCEDURE

The PW diets (Table 1) were designed to provide graded levels of readily available energy. Fresh PW from layers consuming corn-soybean diet PWA and grain by-product diet PWB was collected, mixed with ground corn, ground fescue hay, salt, water, wood shavings and corn starch (Table 1). The mix was packed in cardboard drums lined with plastic bags (two mills) and stored to ensile. Vitamin A and D and an additional 0.1% salt were added to the PW silages at feeding time.

RESULTS

The pH range of the ensilage diets was 4.1 to 4.4 indicating proper fermentation. The animals consumed the PW silage readily, however, daily feed intake was lower on the diets containing wood shavings. As expected, the digestibility of the diet was influenced by the percentage of wood shavings.

Diets 1 and 4 produced a negative nitrogen (N) balance of -2.25 and -2.60 grams of N per day, respectively. The daily N retention for diets 2 and 5 was 0.03 and 1.26 grams, respectively. Diets 3 and 6 had a positive N balance of 3.87 and 3.71 grams per day (Table 2). Energy retention in Kcal per day was 1531, 1723 and 2295 for diets 1, 2, and 3 and 1255, 2160, and 2227 for diets 4, 5, and 6, respectively (Table 3). A numerical linear response of increased N retention with increased retained energy was observed.

The data indicate that the corn and fescue hay levels were sufficient for satisfactory fermentation of PW, however, additional energy is needed for optimal utilization of the nitrogen in the poultry manure silages.

Table 1

Composition of Ensilage Diets

Ingredients	1	2	3	4	5	6
	%	%	%	%	%	%
PWA*	22.7	22.7	22.7	----	----	----
PWB**	----	----	----	22.7	22.7	22.7
Corn	15.9	15.9	15.9	15.9	15.9	15.9
Hay	15.9	15.9	15.9	15.9	15.9	15.9
Wood shavings	10.0	5.0	----	10.0	5.0	----
Corn starch	----	5.0	10.0	----	5.0	10.0
Salt	.1	.1	.1	.1	.1	.1
Water	35.38	35.38	35.38	35.38	35.38	35.38
Vitamin A-D mix	.02	.02	.02	.02	.02	.02
Diet Observations						
Dry matter (%)	41.2	40.8	41.1	41.1	41.7	42.5
Crude protein (%)	10.4	10.8	10.9	12.4	11.2	11.8
Gross energy (Kcal/lb)	2056	2031	1968	2071	2050	1991
pH	4.3	4.4	4.2	4.4	4.2	4.1

*PWA - Manure from a corn-soybean diet.
**PWB - Manure from a grain by-product diet.

Table 2

Nitrogen Retention and Apparent Digestibility of PWA and PWB Diets

	1	2	3	4	5	6
Intake (gm/day)	11.91	12.50	14.68	11.69	15.29	15.65
Retention (gm/day)	-2.25	0.03	3.87	-2.60	1.26	3.71
Apparent digestibility (%)	43	54	65	45	57	64

Table 3

Energy Retention and Apparent Digestibility of PWA and PWB Diets

	1	2	3	4	5	6
Intake (Kcal/day)	3135	3143	3545	2659	3721	3573
Retention (Kcal/day)	1531	1723	2295	1255	2160	2227
Apparent digestibility (%)	49	55	65	47	58	62

TRANSPORTATION SHRINK IN SLAUGHTER CATTLE

Tom Ebinger, J. M. Asplund, Herman Mayes, H. B. Hedrick
Maynard Anderson and Homer Sewell

SUMMARY

These data would indicate that only a portion of the weight loss due to transportation shrink can be attributed to gutfill. There also appears to be a considerable loss of profit-producing tissue. This team hopes to continue this work on stress meats, in an effort to better advise those people involved in production, processing, and packing of slaughter cattle.

INTRODUCTION

This experiment is one of a series, and is a part of a larger project funded by USDA/SEA. The purpose of this study, which was conducted in February, 1979, is to probe further into the area of shrink due to transportation and handling between the feedlot and slaughter. Work done by the same team, both in a pilot test and an October trial, indicated that loss of gutfill contributed only a small portion of the total loss of weight. We continued along this line of thought, trying to correlate any similarities and differences between the environmental conditions of October and February.

PROCEDURE

Forty-two fat steers were selected from a local feedlot. At the feedlot these steers were weighed, ear-tagged, and blood samples were taken. They were hauled directly to Columbia and separated into seven groups, six steers to a treatment group, and arranged randomly in the truck's four compartments to avoid any bias due to positional effects. One group was slaughtered immediately upon arriving in Columbia and another group was held without feed or water for two days before slaughter. The remaining 30 animals were reloaded and trucked 373 miles, round trip before returning to Columbia. Three more groups were removed, one slaughtered immediately, one held for two days without feed or water and another group held for seven days with access to water and feed similar to the diet they received at the feedlot. The remaining two groups were reloaded onto a straight bed truck and transported for an additional 373 miles. Upon returning to Columbia, one group was slaughtered immediately, while the final group was held for two days with access to water only.

The seven groups were identified as:

SHIS - Short haul, immediate slaughter
SH2DH - Short haul, 2 day hold
IHIS - Intermediate haul, immediate slaughter
IH2DH - Intermediate haul, 2 day hold
IH7DH - Intermediate haul, 7 day hold
LHIS - Long haul, immediate slaughter
LH2DH - Long haul, 2 day hold

All animals were weighed and blood samples were taken at each stop in the handling process. After being killed, the viscera were weighed and the contents of the major organs were weighed and sampled. Carcasses were graded and pH and color changes were recorded.

RESULTS

The amount of shrink from the feedlot to slaughter for the February trial is given in Table 1. The same data as shown in Table 2 for October trial. In both trials, the animals lost approximately 50 pounds during the first three to four hours in transit from the feedlot. This amounted to 4.5% of the average steers feedlot weight on trial. During the subsequent 321 miles, those animals in the February trial lost an additional four pounds or .6% of body weight. Considerable more weight loss was observed in the October trial where the animals lost 30 pounds or 3.1% of their body weight over a similar distance. In both the October and February trials, the long haul animals, traveling a total of 746 miles, essentially lost no more additional weight than those animals hauled the intermediate distance. Those animals in the October trial, being held two days without feed and water lost an average of five to ten pounds more than those animals in the colder temperature of February.

In both thermoneutral and cold conditions, major weight losses came early in the transportation. Weight loss increases hereafter at a decreasing rate. Those animals held seven days and allowed feed and water, recovered much of their losses, particularly those in the October trial. Animals in the October trial only lost an average of 20 pounds, whereas those in the February trial lost nearly 40 pounds.

This seems to indicate that it takes at least a week and perhaps longer to regain this weight loss during a short haul (52 miles).

A few indications of tissue lost in shrink are given in Tables 1 and 2. We must assume that there is very little or no weight loss in the head, hide and hoofs. Visceral shrink is calculated as the loss in weight of digestive organs, heart, lungs, liver and spleen. This visceral shrink accounted for only 17 to 37 percent of the total shrink in the October trial and 16 to 47 percent in the February trial. Therefore, 50 to 80 percent of the weight lost comes from the carcass during transportation. Of the gut contents, rumen digesta shrink accounted for 80 to 100 percent of the total content shrink in both trials.

Table 1

Influence of Transportation and Holding on Shrink in Slaughter Cattle (February)

Group	Total lbs.	Shrink %	Gross Visceral % of Total Shrink	Gut Content % Total Shrink	Rumen Shrink % Content Shrink
SHIS	52.17	4.5	*	*	*
SH2DH	61.83	5.5	46.9	32.3	*
IHIS	56.83	5.1	15.7	23.5	86.3
IH2DH	66.67	6.1	31.0	26.1	40.5
IH7DH	39.50	3.6	*	*	*
LHIS	46.00	4.3	44.8	33.0	*
LH2DH	70.33	6.1	26.5	17.0	78.7

*Values not applicable.

Table 2

Influence of Transportation and Holding on Shrink in Slaughter Cattle (October)

Group	Total lbs.	Shrink %	Gross Visceral % of Total Shrink	Gut Content % Total Shrink	Rumen Shrink % Content Shrink
SHIS	51.2	4.6	*	*	*
SH2DH	101.2	9.4	16.9	15.3	82.4
IHIS	82.3	7.7	29.0	24.9	98.0
IH2DH	99.3	9.3	37.4	29.5	99.6
IH7DH	20.5	1.9	*	*	*
LHIS	84.3	7.7	21.3	24.6	80.1
LH2DH	98.7	8.8	27.6	26.0	87.4

*Values not applicable.

COMPUDOSE: A NEW CALF IMPLANT[a]

Mark Stewart, Larry Wilson, Dennis Jacobs, Bud Reber and David Bowman

SUMMARY

This trial is being conducted cooperatively with the UMC South Farm, the Forage Systems Research Center, and North Missouri Center and will be completed in October, 1979.

INTRODUCTION

In recent years there has been increased use of growth stimulant implants in all phases of growing cattle. Many producers have received increases in growth rate and feed efficiency when using the implants.

Most implants remain active about 90-120 days after insertion. We are testing an experimental product which may remain functional for more than 20 months. This may be a "lifetime" implant for steer calves.

We are testing this implant (which we will refer to as Compudose) on the 1978 Hereford steer crop from the Forage Systems Research Center and the North Missouri Center. These steers are being followed through the suckling, growing, and finishing phases as we evaluate the effect of the implant.

PROCEDURE

Bull calves dropped in the spring of 1978 were immediately castrated and randomly assigned to one of the three treatment groups shown in Table 1.

Table 1

	Suckling	Backgrounding	Feedlot
Control	No implant	No implant	½ implanted with Compudose ½ no implant
Compudose	Implanted	Implanted	½ remove Compudose ½ remain implanted
Ralgro	No implant	Implanted	½ not reimplanted ½ reimplanted Ralgro

[a]Research partially funded through a grant from Eli Lilly Research Laboratories and Elanco Products Company.

During the suckling phase the calves were running with the cow herds at the North Missouri Center and the Forage Systems Research Center. As shown in Table 1, the Compudose calves were implanted during suckling and will remain implanted until May 22, 1979, at which time one half of the implants will be removed.

The Ralgro calves were implanted at weaning; at this time the North Missouri Center calves were moved to the Forage Systems Research Center. They were wintered there on pasture and soybean hay.

On March 13, 1979, the steers were moved to the UMC South Farms where they were assigned to lots for the completion of the growing phase and will remain there through the feedlot phase.

A BRIEF SUMMARY OF THE 1978 MISSOURI PASTURE LEASE SURVEY

Vic Jacobs

SUMMARY

The average lease prices reported in 1978 were near $20 per useful acre and a little under $5 per AUM (or "animal unit month"). Most tracts were leased on a per acre basis with one-fourth on a per head per month basis. Despite the predominance of oral one year leases, substantial stability was evident with the average lease in its fourth year. When the first year leases were ignored, the average prior years of the remaining leases was in excess of five years. Determining the full price paid is difficult, however, because of the "in-kind" payments or services paid in addition to the cash that changes hands.

Types of Lease Contracts and Methods of Payment.

As can be seen in Table 1, over 70% of the tracts rented on a per acre basis--with another 25% rented on some sort of per head per month basis.

Generally, the lessee (cattleman or renter) has more privileges and can take hay or seed when he rents by the acre, but not when he rents for a per head per month price. Similarly, the per acre lessee more commonly fertilizes or performs yield increasing services when he rents by the acre but does not when he rents on a per head per month or season basis.

Lease Periods and Existence of Written Contract.

While the average lease arrangement had existed between the same lessee and lessor for 3.6 years, 81% of the leases were only one year or season in length. With many of the 19% which were multi-year leases, the lessee also leased cropland from the lessor or landowner.

Oral leases predominated in the one year leases (75%) while 81% of the multi-year leases were written leases.

Lease Prices for "per acre" Leases.

Table 2 details the average reported per acre lease prices by privileges and responsibilities exercised by the lessee.

As can be seen in Table 2, lessees generally paid a slightly higher price where they had wider use options and could use any combination of grazing, haying, or combining to harvest the acres production.

Lease Prices on a "per head per month" Basis.

Because all weights, ages, and classes of cattle were reported by the 25% renting on a per head per month basis, all were converted to an AUM (or Animal Unit Month) basis as a common denominator or yardstick. Thus, a cow without a calf is 1.0 AU; cow with spring calf is 1.2 AU's; and a 600 lb yearling was converted to 0.7 AU. By use of these conversions, all reported per head per month prices were converted to prices per AUM.

The average price per AUM is reported in Table 3.

Also, since per head per month leases were fewer, the per acre lease prices were converted into equivalent prices per AUM. All per acre lessees were asked to estimate carrying capacity in either cow months or yearling months per acre.

Thus, in Table 3, the per acre leases are also reported in equivalent AUM prices. As can be seen in Table 3, these AUM prices estimated from the reported per acre prices are quite comparable to the AUM prices of the per head per month leases ($4.99/AUM vs. $4.73).

The average AUM price of $4.91 can be converted back to per head per month prices for a cow-calf or yearling by multiplying by the AU's per head. Thus, the equivalent average price per month for a cow and spring calf is $4.91 x 1.2 AU's--or $5.89 per month. For a yearling it is $4.91 x .7--or $3.44/month.

It should be noted that these per head per month (or per AUM) prices do slgihtly understate the full price paid. The reason is that some lessees also performed non-cash services such as clearing, seeding, fence improvement, etc., in addition to the cash price.

Per Head Per Month Lease Prices and Pasture and Facility Qualities and Lessor Provided Services.

Per head per month prices varied widely, but some of the price variation was apparently associated either with the quality of pasture, fences, and facilities; or with the services provided by the lessor (landowner). Table 4 reports prices by reported qualities and lessor services.

Table 5 reports prices by an "aggregative" quality score. Depending on services provided by the lessor (checking cattle, maintaining fences and facilities, fly control, salting, etc.), and on qualities of pasture, fences, water, and other facilities, an aggregate score ranging from zero to 12 was assigned each tract. As can be seen in Table 5, the average price per AUM varied from a low of $4.17 (for 8 tracts) to $6.50 (for the highest scoring 5 tracts).

Table 1

Distribution of 136 Missouri Pasture Leases
by Method of Payment
and Related Lessee Privileges and Responsibilities

Payment Method (and Lessee Rights & Responsibilities)	Number	Percent
A. Per Head per Month Price	34	25.0
B. Per Acre per Year Price	97	71.3
•• Lessee neither fertilizes nor takes hay or seed -- 22 contracts		
•• Lessee fertilizes and can take all hay and usually seed -- 30 contracts		
•• Lessee can take all hay and/or seed but doesn't fertilize -- 34 contracts		
•• Lessee fertilizes but no hay or seed -- 7 contracts		
•• Lessee harvests hay, but on shares -- 4 contracts		
C. Per Pound of Gain	2	1.5
D. Unique (50:50, payment in kind, etc.)	3	2.2
	136	100.0

Table 2

Average per Acre Lease Prices
by Lessee Rights and Responsibilities

Lessee Rights & Fertilization Responsibilities	Per Total Acre	(No)	Per Useful Acre	(No)
A. Does not take hay nor fertilize .	$16.78	(22)	$19.28	(21)
B. Can take hay or seed, does fertilize	17.02	(30)	20.74	(28)
C. Can take hay or seed, doesn't fertilize	18.80	(34)	20.59	(34)
D. Does not take hay or seed, does fertilize	13.50	(7)	15.33	(7)
E. Can take hay only on shares . . .	12.74	(4)	13.42	(4)
TOTAL (All per acre leases)	$17.16	(97)	$19.64	(94)

Table 3

Pasture Lease Rates per AUM

		Rate Per AUM
A. "Per Head per Month" leases (34)		$4.73
B. Per Acre per Year Leases:		
•• Lessee neither fertilizes nor hays	$5.20	
•• Lessee fertilizes and can take hay or seed	4.81	
•• Lessee doesn't fertilize, can take hay or seed	5.19	
•• Lessee can fertilize, buy no hay or seed	4.18	
•• Lessee can hay -- but on shares	3.94	
All per acre per year leases	$4.99	
All 116 Leases		$4.91

Table 4

The Relation of Lease Price to Pasture and Facility Qualities and to Lessor Services (per head per month leases)

	Above Average	Average	Below Average
Lessor Services	$5.71	$4.60	$4.11
Boundary Fences	5.05	4.33	4.41
Interior Fences, Corrals, etc.	5.45	4.82	4.14
Water Supplies	5.07	3.59	
Livestock Performance	5.29	4.74	3.31

Table 5

The Relation Between an Aggregate "Qualitative" Rating by Respondents and the Price Paid per AUM (per head per month leases only)

	Aggregate Qualitative Rating Score			
	0-4	5-7	8-10	11-12
Number of Tracts	8	8	13	5
Average Price Per AUM	$4.17	$4.29	$4.75	$6.50

University of Missouri
Agricultural Experiment Station Lands
(Boone- Howard- Callaway Counties)