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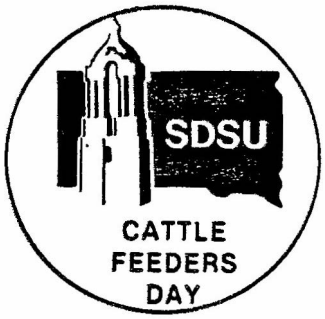

EFFECT OF MIXED OR PHASE FEEDING TWO RATIOS OF CORN AND CORN SILAGE ON PERFORMANCE OF FEEDLOT STEERS

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Summary

One hundred twenty-eight Angus steer calves were used in a feedlot study to determine the effect of mixed vs phase feeding on efficiency of utilization of corn and corn silage. Mixed diets (M) containing 1/3 corn - 2/3 corn silage (1:2M) or 2/3 corn - 1/3 corn silage (2:1M) were compared with phase feeding (P) treatments where corn silage was fed during the initial 87d (2:1P) or 143d (1:2P) and followed by high corn finishing diets. Cattle fed mixed diets had higher average daily gains initially and required fewer days and less total feed to reach slaughter condition. Slow growth associated with all corn silage diets was not completely compensated for after switching to high corn diets on the phase feeding treatments.

Introduction

An important consideration for the midwestern farmer-feeder is to find a feeding program that optimizes production in the farming operation. One common option available in this region is to vary the levels of corn and corn silage used in growing and finishing diets. Variables that must be included in this decision are: 1) possible negative associative effects on digestibility caused by grain-forage mixtures; 2) possible affects on carcass weight and quality; and 3) the amount of time cattle must be on feed.

Two ratios of corn and corn silage were fed either as a mixture provided throughout the feeding period or in phases as a high corn silage backgrounding period followed by a high corn finishing period. The effects of these treatments as the efficiency of feedlot production was determined.

Experimental Procedure

One hundred twenty-eight Angus steer calves ($\bar{x}$ 526 lbs) were used to evaluate the effects of phase feeding corn-corn silage diets on the efficiency of feeder cattle production. Treatments used were: a mixture of 1/3 corn - 2/3 corn silage fed throughout the feeding study mixed (1:2M) or in phases (1:2P); and 2/3 corn - 1/3 corn silage fed mixed throughout the study (2:1M); or in phases (2:1P). The amount of silage fed on the phase treatments was projected to be similar to total silage consumption on mixed treatments. Diets fed are shown in table 1 and table 2 shows the sequence of feeding treatments.

Four pens of 8 steers were assigned to each of the 4 treatments. Steers were allotted to 4 weight groups based on weights taken 2d prior to the start of the trial and then randomly assigned to treatment by weight group.

All weights were taken in the morning before feeding. On the day previous to initial and final weights, steers were fed 1/2 of the previous days feed intake and water was removed in the late afternoon.

Fat probes were made periodically,[1] as cattle approached slaughter condition using a Cook's Probe at a sight between the 12th and 13th rib. All cattle within a pen were slaughtered when 6 steers within the pen had a rib fat probe >.40" and were visually estimated to grade choice. Quality and yield grade data were collected to verify that cattle were of consistent slaughter condition between slaughter dates.

Performance data was compared for 3 feeding phases. Phase 1 ended when steers fed 2:1P were switched from corn silage to high corn diet (day 87). Phase 2 ended when 1:2P steers began receiving the finishing diet (day 143). Phase 3 ended when cattle were slaughtered.

Results and Discussion

Rib fat thickness determined by probe within 14d of slaughter, carcass weight, quality grade and yield grade were not affected by treatment, indicating steers were of similar body composition when slaughtered. Since no differences exist in these variables days on feed may be compared between treatments. Steers fed mixed diets tended to reach slaughter condition sooner than those fed separate diets (table 3).

Energy density of the diet during phase 1 affected average daily gains (ADG) (table 2). Steers fed diet 2:1P weighed 40.2 lb less ($P<.05$) than those fed 2:1M after 87d. This weight advantage for 2:1M diet persisted through Phase 2 as well since ADG were similar for that period. Phase 3 ADG, cumulative ADG and final weight did not differ between steers fed diets 2:1S and 2:1M.

At the end of Phase 2, 1:2M steers were 44.5 lb heavier ($P<.05$) than 1:2P steers. Average daily gains to this point were 2.86 and 2.52 lb/hd/d respectively and differed ($P<.05$). As in 2:1 treatment comparisons final phase and cumulative ADG did not differ (table 2).

Feed intake was greater for treatment 2:1M than for all other diets during Phases 1 and 2. During Phase 3 cattle on the 2:1 treatments had higher intakes than those on 1:2 treatments. Cumulative intake (lb/hd/d) were affected by treatment. Dry

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[1] Cook's Probe, Cook's Laboratory, Lusk, Wyoming.

matter intake for the entire feeding period was greatest on treatment 2:1M, lowest on treatment 1:2M with the phase feeding treatments intermediate.

Feed efficiency was lower during Phase 1 for treatment 1:2M and lower during Phase 2 on treatment 2:1P. When evaluating responses for the entire feeding period no differences in feed efficiency due to treatment were observed.

When comparing the amounts of corn and corn silage fed, total silage intake was similar for treatments 1:2M and 1:2P as intended. However, steers on 1:2P treatment required 62% more corn than those fed the mixed diet. When the 2:1 series treatments are compared, 2:1P steers consumed 18% more corn silage and 9% more corn than 2:1M steers.

Part of this increased feed requirement can be attributed to lower ADG during Phase 1 for 2:1P steers and Phases 1 and 2 for 1:2P steers. Lower ADG during these periods caused relatively greater proportions of feed to go toward maintenance requirements as does the increased days on feed that resulted.

Another consideration is time of year when ration switches were made. The diet changes for treatment 2:1P was made February 12 and the 1:2P change was made April 9. All cattle were slaughtered by July 16. This means that treatment 1:2P steers were receiving the high concentrate diet principly during April and May when moisture and mud are a problem at this feedlot. Since these conditions can have a greater impact on maintenance requirements than low winter temperatures this may inflate the corn requirement when separate diets were fed.

Feeding high corn silage diets for only 87d lowered overall production efficiency. Rapid growth associated with high concentrate feeding did not compensate for early slow growth. High roughage diets fed as long as 143d did not increase carcass weight when steers were slaughtered at a common degree of finish. The data indicate that the most effective way to utilize corn and corn silage in a feeding program is to feed a relatively high ratio of corn:corn silage mixed (2:1M), to calves. Following this program with a high corn finishing diet would also be recommended.

Table 1. Composition of Diets

Ingredient[a]	Diet: 85% corn silage[b]	60% corn silage	30% corn silage	12% corn silage[c]
Corn, %		28.87	58.23	82.95
Corn silage, %	85.58	57.75	29.05	12.00
Soybean meal, 44%	12.48	11.24	10.00	3.60
Limestone, %	1.00	1.15	1.37	.90
Potassium chloride, %	.34	.59	.95	.15
Trace mineralized salt, %	.40	.40	.40	.04
Crude protein, %	13.1	13.1	13.1	11.0
NEm, Mcal/cwt	72.1	80.1	88.0	94.7
NEg, Mcal/cwt	44.3	51.2	58.0	63.8

a Percent dry matter basis.

b Fed during Phase 1 2:1P, during Phases 1 and 2 1:2P.

c Fed during Phases 2 and 3 2:1P, during Phase 3 1:2P. All diets were supplemented to provide 1100 IU Vitamin A/lb dry matter.

Table 2. Sequence of Diet Used by Treatment[a]

Phase	1	2	3
Length, d	87	56	Variable
Treatment			
1:2P	85% corn silage	85% corn silage	12% corn silage
2:1P	85% corn silage	12% corn silage	12% corn silage
1:2M	60% corn silage	60% corn silage	60% corn silage
2:1M	30% corn silage	30% corn silage	30% corn silage

a Diets shown in table 1.

Table 3. Feedlot Performance by Treatment and Phase of Trial

Phase		Treatment 1:2P	2:1P	1:2M	2:1M
	Initial wt., lb	528	525	522	529
1	Ending wt., lb	755^{d,e}	751^{d}	775^{e}	792^{f}
	ADG[a], lb/hd/d	2.61^{d}	2.59^{d}	2.90^{e}	3.02^{e}
	DMI[b], lb/hd/d	13.19^{e}	13.49^{e}	13.08^{e}	15.00^{f}
	F/G[c]	5.05^{d}	5.21^{d}	4.51^{e}	4.97^{d}
2	Ending wt., lb	888^{d}	926^{e}	933^{e}	967^{f}
	ADG, lb/hd/d	2.38^{d}	3.13^{e}	2.82^{d,e}	3.13^{e}
	DMI, lb/hd/d	20.19^{e}	17.67^{d}	19.81^{d}	22.36^{f}
	F/G	8.57^{f}	5.67^{d}	7.03^{e}	7.23^{e}
3	Ending wt., lb	1126^{d,e}	1133^{e}	1093^{d}	1102^{d,e}
	ADG, lb/hd/d	2.66^{e}	2.49^{d,e}	2.26^{d,e}	2.17^{d}
	DMI, lb/hd/d	23.79^{e}	26.80^{f}	21.61^{d}	26.46^{f}
	F/G	9.07^{d}	10.86^{d,e}	9.79^{d}	12.29^{e}
Cumulative	Days on feed	234^{e}	227^{e}	216^{d,e}	206^{d}
	ADG, lb/hd/d	2.57^{d}	2.68^{d,e}	2.65^{d,e}	2.80^{e}
	DMI, lb/hd/d	18.99^{e}	19.41^{e}	17.72^{d}	20.53^{f}
	F/G	7.41	7.26	6.70	7.38

[a] Average daily gain.

[b] Average daily dry matter intake.

[c] Feed/gain.

[d,e,f] Means in the same row with different superscripts differ ($P<.05$).

Table 4. Fat Thickness and Carcass Traits of Steers by Treatment

Treatment	1:2S	2:1S	1:2M	2:1M
Rib fat thickness[a], in	.45	.46	.45	.48
Carcass weight, lb	681	692	682	679
No. Choice	26	27	26	29
No. Good[b]	5	5	4	2
No. YG 2[b]	12	15	19	13
NO. YG 3[b]	18	16	12	19

[a] Inches, measured between 12-13th rib in live animal.

[b] USDA Quality and Yield Grades.