

Comparison of Barley-Alfalfa Rations for Fattening Steers

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Summary

Steer calves were fed individually twice daily on rations containing barley, protein supplement, and alfalfa pellets. There was no daily gain advantage in feeding concentrates at more than approximately 2% of body weight daily. Feed conversion and cost of gain slightly favored those lots which received larger amounts of steam-rolled barley. Cattle in a lot fed the high steam-rolled barley ration for approximately 128 days gained equally as well as cattle in a lot fed the high barley ration for approximately 185 days. Steers fed a combination of protein supplement with ground barley and alfalfa pellets free choice gained as fast but at less expense than animals fed a comparable steam-rolled barley ration. Bloat, however, was a problem with some cattle fed ground barley.

The most efficient and cheapest gains with current feed prices were made by steers on two linear programmed rations containing large amounts of wheat mixed feed.

There was no relationship between gain or estimated energy intake and marbling scores of the rib eye.

Introduction

All-concentrate or high-concentrate rations -- made up chiefly of barley with a minimum of roughage -- have recently received a considerable amount of publicity. To answer some of the questions about this type of feeding, steer fattening trials were started last fall at Corvallis. Other experiments are being conducted at branch stations at Malheur and Milton-Freewater to evaluate a variety of rations under different conditions. Results of these trials will be reported later.

The Corvallis trials were designed to compare the feeding of various quantities of steam-rolled barley, to determine the response of cattle fed high barley rations for various periods of time, and to compare steam-rolled to ground barley.

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Procedure

Experimental steers from a ranch near John Day, Oregon, were moved to Corvallis immediately after weaning. They were started on alfalfa pellets and shifted gradually to their respective rations during the next three or four weeks. Cattle were on test from November 5, 1960, to June 5, 1961--212 days. Lot 10 cattle, however, were fed 206 days. Cattle in all lots were fed individually in stalls twice daily. All steers were implanted with 24 milligrams of diethyl stilbestrol December 2, 1960.

Initial and final weights were taken after an overnight shrink. Rations fed are described in Table 1, page 3. Lots 1, 2, 5, 6, and 9 were fed concentrate at either 1.5 or 2.0% of their body weight, daily, all or part of the trial. Note that this was the maximum amount of feed offered. Actual feed consumption did not reach these levels.

When evaluating these results, remember that number of animals (4 per treatment) was small. Consider this work more a report of a pilot trial than a completed study. When comparing results to commercial conditions it is probable that individual feeding will reduce rate of gain due to restricted access to feed. Individual feeding, however, was used because of several advantages which occur when dealing with a few animals on a research trial.

How Gains Were Computed

Relative gains and feed conversion are shown in the tables. Here is how these figures were derived: an arbitrary percentage (56%) of live weight was used to calculate initial carcass weight. Since final hot carcass weights were available, carcass gain was estimated, thus eliminating variations in fill that occur when live weight is taken at the end of the trial. This procedure does not get around differences in fill on initial weights, but these weights should be less variable since all animals had been on the same feed and were weighed after an overnight stand without feed or water.

After carcass gain was calculated for each lot the figures were converted back to live gain. The average carcass gain for Lot 1 (304 lbs.) was considered equal to 100%. Carcass gains of the other lots were percentages of Lot 1. Now it is simply a matter of multiplying this percentage times the daily gain of Lot 1. For example, the calculated carcass gain for Lot 4 was 330.5 pounds--equal to 108.63% of Lot 1 (304 lbs.). $108.63\% \times 2.22 = 2.41$, the relative daily gain for Lot 4. This procedure does not result in marked differences from conventional live weight figures except where there are appreciable differences in final dressing percentages, such as for Lot 10A. Although there may be some objections to this method of comparison, the authors feel that it provides a more meaningful comparison of gain between groups.

The data in Tables 1-4 are self-explanatory. Some comments on performance, however, are in order. Feeding more concentrate (steam-rolled barley) than that received by Lot 2 (maximum of 2% of body weight) did not improve gains, compared to lots which received rolled barley for most or all of the feeding period (Lots 1-6 and 9). Feed conversion (air dry basis), however, was improved and cost of gain was reduced slightly by feeding more barley. It is possible that if the roughage had been fed as chopped hay or silage, rather than alfalfa pellets, lots receiving higher levels of grain might have responded more.

Results

Table 1. Rations Fed to Experimental Steers

<u>Lot No.</u>	<u>Ration</u>
1 - - - -	1.5% of body wt. daily as concentrate; 1 lb. protein supplement+steam-rolled barley; alfalfa pellets to appetite.
2 - - - -	2.0% of body wt. daily as concentrate; 1 lb. protein supplement+steam-rolled barley; alfalfa pellets to appetite.
3 - - - -	1 lb. protein supplement, steam-rolled barley and alfalfa pellets free choice.
4 - - - -	Hi barley; 2 lb. protein supplement, 2 lb. alfalfa pellets, steam-rolled barley free choice.
5 - - - -	Alfalfa pellets only for 83 days; 1.5% of body wt. as concentrate (steam-rolled barley) from 84-139 days; Hi barley from 140-212 days.
6 - - - -	1.5% of body wt. as concentrate (ground barley) for 83 days; Hi steam-rolled barley from 84-212 days.
7-8 - - - -	1 lb. protein supplement; ground barley and alfalfa pellets free choice.
9 - - - -	Hi ground barley (55 days); went off feed and were shifted to 1.5% of body wt. daily of steam-rolled barley.
1-9 - - - -	Protein supplement (in pounds per ton): cottonseed meal, 875; soybean meal, 875; ground limestone, 50; steamed bone meal, 40; salt (trace mineralized), 51; antibiotic supplement (80 grams/T - Oxytetracycline), 8; vitamin A supplement (500 I.U./lb.), 1.
10A - - - -	In pounds per ton: alfalfa pellets, 3/16", 400; wheat mixed feed (mill run), 974; mol. dried beet pulp, 200; ground corn, 367; ground limestone, 45; salt, (trace mineralized), 6; vitamin A supplement (250 I.U./lb.), 1; antibiotic premix, 8 grams/T oxytetracycline, 1.
10B - - - -	In pounds per ton: alfalfa pellets, 3/16", 100; wheat mixed feed (mill run), 1,000; mol. dried beet pulp, 200; ground corn, 628; ground limestone, 57; salt (trace mineralized), 6; vitamin A supplement (250 I.U./lb.), 1; antibiotic premix, 8 grams/T oxytetracycline, 1.

Table 2. Animal Performance on Various Rations, Average Per Head

Live weight data					Feed data ^{c/}											
Lot ^{a/} No.	Initial	Final	Total gain	Ave. daily gain	Ave. relative gain ^{b/}	Total intake	Average daily intake					Total concentrate	Est. TDN	Feed conversion	Rel. feed conversion ^{b/}	Rel. TDN conversion ^{b/}
							Total	Barley	Protein supplement	Alfalfa pellets	Other					
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	%				
1	476	946	470	2.22	2.22	3768	17.8	8.29	0.81	8.67		51.2	2341	8.01	8.01	4.98
2	480	1001	521	2.46	2.41	3988	18.8	11.00	0.83	6.98		62.9	2610	7.65	7.82	5.12
3	475	972	497	2.35	2.28	3792	17.9	9.58	0.92	7.39		58.7	2467	7.63	7.84	5.10
4	478	998	520	2.45	2.41	3626	17.1	11.53	1.63	3.94		77.0	2542	6.97	7.10	4.97
5	471	972	501	2.36	2.24	3979	18.8	8.05	0.87	9.85		47.5	2458	7.94	8.38	5.17
6	489	1021	532	2.51	2.42	3811	18.0	11.40	1.41	5.15		71.3	2606	7.16	7.43	5.08
7	480	985	505	2.38	2.22	3760	17.7	7.22	0.87	9.64		45.6	2295	7.44	8.00	4.88
8	476	1001	525	2.48	2.38	3946	18.6	7.97	0.93	9.72		47.8	2420	7.52	7.82	4.68
9	466	949	483	2.27	2.20	4051	19.1	7.89	0.93	10.29		46.2	2458	8.40	8.70	5.27
10A	384	941	557	2.70	2.21	3188	15.5					76.6	2001	5.72	6.82	4.28
10B	364	859	495	2.40	2.18	2876	14.0					88.8	1910	5.80	6.22	4.13

^{a/} See Table 1 for a description of rations fed to each lot.

^{b/} Data based on estimated carcass gains; method explained on page 2.

^{c/} Feed weights are on an air dry basis.

Table 3. Carcass Data and Cost of Gain

Carcass data					Cost data		
Lot No.	Hot wt. lbs.	Dressing percent	Grade ^{a/}	Marbling score ^{b/}	Per steer	Per cwt. gained	
						Live basis	Relative gain basis
1	570	60.3	14.2	11.5	\$91.68	\$19.51	\$19.51
2	598	59.8	14.5	10.5	99.28	19.06	19.47
3	578	59.5	14.5	11.5	94.08	18.93	19.44
4	598	59.9	15.2	11.0	95.98	18.46	18.78
5	571	58.7	14.2	11.8	96.14	19.19	20.24
6	605	59.3	15.2 ^{c/}	10.3 ^{c/}	98.28	18.47	19.16
7	572	58.1	13.2	9.2	89.13	17.65	18.96
8	592	59.2	15.2	14.2	93.96	17.90	18.64
9	562	59.2	14.3	10.3	97.50	20.19	20.92
10A	518	55.0	14.5	13.0	83.72	15.03	17.89
10B	503	58.5	13.5	7.0	77.85	15.73	16.85

a/ 14 is equivalent to average good, 15 to high good.

b/ 11 is equivalent to small -, 14 is modest -.

c/ Data missing for one steer.

Table 4. Feed Prices Used in Computing Cost of Gain

Ingredient	\$/Ton
Alfalfa pellets	42
Steam-rolled barley	52
Ground barley	50
Protein supplement	86
Wheat mixed feed	42
Mol. dried beet pulp	48
Corn	57
Limestone	19
Salt, trace mineralized	46
Vitamin A	30¢/T
Antibiotic	80¢/T
Milled feeds (lot 10A)	53
(lot 10B)	55

Since it has been demonstrated elsewhere that animals gain more on alfalfa pellets than on chopped hay, we would have expected those lots restricted on grain to show some reduction in gain if they had been fed chopped hay.

When comparing the three lots which received the high barley ration for all or part of the period (Lot 4 from start; Lot 6 from 84 days; Lot 5 from 140 days), data indicate that Lot 6 gained equally as well as Lot 4 which received a high barley ration for a longer time. For some reason the cattle in Lot 5 never increased their rate of gain appreciably when changed from alfalfa pellets to 1.5% of body weight as concentrate and then to the high barley ration. Marbling scores, however, were as high for this lot as for any of the other steam-rolled, barley-fed lots.

Data from this trial suggest that the chief advantage of feeding high-grain rations to fattening calves for most of the fattening period is a slight improvement in feed conversion. Neither gain nor carcass quality changed appreciably by increasing grain consumption over that of other lots. Feed costs prevailing in a particular area will determine whether the high grain rations are cheaper than those containing more "normal" levels of roughage. The way these cattle were fed (in stalls two times daily) may have influenced performance. It is possible that those cattle on the high grain rations may have suffered more of a disadvantage than those receiving more roughage. Observations of cattle on high concentrate rations elsewhere indicate they prefer to eat more frequently than cattle receiving more roughage.

The two lots which received ground barley and alfalfa pellets free choice (Lots 7 and 8) gained equally as well as cattle in Lot 3 which received rolled barley and alfalfa pellets free choice. Cattle in Lot 3 were slightly less efficient in feed conversion, although those in Lots 7 and 8 consumed approximately 46.7% concentrates compared to 58.7% for those in Lot 3 (rolled barley). There was some difficulty with bloat in Lots 7 and 8 (ground barley). Two calves bloated frequently and required occasional treatment, while only one steer in any of the lots receiving steam-rolled barley required treatment for bloat.

Computer-Formulated Rations Tested

Two milled rations were fed to Lot 10 to determine if an electronic computer could successfully formulate rations on a least-cost basis with a given set of quality specifications (which are admittedly inadequate). Quality specifications were set for crude protein, crude fiber, estimated net energy, calcium, and phosphorous. A few other restrictions were imposed, but did not have an appreciable bearing on feed selection. The performance of the calves on these two rations was adequate on a live gain basis, but those receiving one ration (10A) had a low (55%) dressing percent. Consequently, when relative gain was calculated they did not compare as well to other lots. However, both rations were efficient in feed conversion regardless of the method of calculation.

One might expect that these calves would be more efficient than those in other lots since they were lighter when started on experiment. For the feed prices used, cattle on these two rations made cheaper gains than those on any of the other rations. Feed prices, of course, will vary considerably throughout the country. Even though data are limited, this pilot trial indicates some promise in the use of a computer to formulate fattening rations for cattle.

Feeding Problems Encountered

No important problems were encountered. Cattle in Lot 9, however, went off feed when alfalfa pellets were restricted. The original plan had been to remove all hay from Lots 4, 5, and 6 (high barley rations). Since diarrhea was a problem when the alfalfa pellet intake was restricted and since cattle did not have free access to feed, minimum alfalfa pellet intake was held at 2 pounds daily. When a calf had diarrhea, pellet intake was increased for a few days. Several of the calves in these three lots appeared slightly stiff. Only one calf (in Lot 5) foundered mildly and this did not affect his performance. Diarrhea also was a problem initially in Lot 10, but did not continue long. One calf (Lot 10A) bloated occasionally, but not severely.

Foot rot was an occasional problem when the trial started. Use of a commercial organic iodide at recommended levels successfully corrected this situation.

A mixture of trace-mineralized salt and steamed bone meal was fed free choice to all lots. Although exact records were not maintained (due to wastage from feeders) consumption of this mixture was much higher by the three lots on high barley rations than by the other lots. Frequent "cribbing" was noted, but this was prevented by supplying steamed bone meal in the feed bunks. It may be that the phosphorus requirement is increased on high grain rations.

When cattle were slaughtered, observations were made in the packing plant for liver abscesses. Two each were noted in Lots 4 and 10, one each in Lots 6, 8, and 9. Observations also were made for inflamed bladders as an indication of urinary calculi, and rumens were spot-checked for parakeratosis. Neither of these conditions was observed.

Grading

U. S. Department of Agriculture carcass grades are determined primarily by age, carcass conformation, marbling in the rib eye if the carcass is quartered before grading, color, and texture. Cattle in this trial were from 14 to 16 months old when slaughtered. Yet, 29 out of 40 head were called "B" age cattle--an age rating which is considered to be approximately 18 months of age or over. There was a slightly lower percentage of "B" cattle marketed in a group of experimental animals two months earlier from the Malheur Experiment Station at Ontario, Oregon. The eastern Oregon cattle were about 10 months older. Consequence of this age rating is that the carcass must have a higher conformation score or more abundant marbling to get into a given grade when classed as "B" rather than "A" age cattle.

In the data reported here, very little relationship can be shown between marbling and percentage of concentrate in the ration, estimated TDN intake, rate of growth, etc. In addition, meat evaluation studies have shown very little relationship between marbling and consumer meat preference for cattle of this approximate age. The current heavy emphasis on marbling in grading of carcasses affects price considerably, but there appears to be very little the feeder can do to influence marbling in young cattle.