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Supplementing Yearling Summer-Grazing Cattle with Fat and Protein and Subsequent Feedlot Performance

Ivan G. Rush¹

Protein and fat supplementation to grazing yearling cattle increases summer gain and this gain advantage is maintained throughout finishing.

Summary

Yearling steers supplemented with protein (40% - 29% NPN - 19% from biuret) while grazing primarily crested wheat grass in the summer gained at a faster rate than control steers which were only provided a commercial salt/mineral mix. A lower level of protein (20% - 6.7% NPN)/fat (15% -20%) combination supplement also increased gain over controls, but the supplement response was less than the higher protein supplement. Gain responses were greater during the latter part of the grazing season when forage quality was poorest. Supplementation intake varied but tended to be greater during the latter part of the grazing season. The control summer grazing cattle that gained at a slower rate did not compensate and gain faster when finished after the summer grazing season. When both the grazing and finishing phases were considered, cattle receiving either the protein or the protein/fat summer supplement gained 59 more pounds than the control mineral supplemented cattle. Carcass traits were similar for all cattle.

Introduction

Summer-grazing yearling cattle often offers relatively low cost of gain and thus can potentially lower the cost of producing beef. In some cases, summer gains can be increased by supple-

menting either energy or protein. After forages are mature and the protein content drops, gains will decrease because of protein deficiency. Some research has shown supplementing undegradable intake protein (UIP) can enhance gains in lush green pastures even though crude protein may be relatively high. Energy supplementation has the potential of increasing gain, however supplementing with high starch grains such as corn may interfere with forage digestion. Less is known about the effect of supplementing fat to yearlings grazing grass, but it could serve as an energy source without adversely affecting forage digestion if fed at low levels.

When gain is increased on grass, the level of compensation in the feedlot by the slower gaining cattle often offsets at least a portion of the previous advantage for the faster gaining cattle. The level of compensation is difficult to predict but is very important when considering the total production system.

The objectives of this experiment were to: 1) evaluate steer performance while grazing summer pasture when either supplemented with a commercial mineral or fat and/or protein in a prepared tub and to evaluate weekly intake of the supplements, 2) evaluate feedlot performance and carcass characteristics of cattle after the grazing period.

Procedure

Grazing Phase

Ninety head of primarily Angus steers weighing an average of 662 lbs were used in this 113-day summer grazing trial. The three supplemental treatments used were: 1) salt/mineral supplementation, 2) a 250 lb tub containing 40% protein (29% NPN - 19% from biuret), and 3) a 250 lb tub containing a combination of protein and fat. Initially the

combination tub contained 20% protein (6.7% NPN) and 20% fat, and after the first 28 days the fat level was lowered to 15%. Primary ingredients for the 40% tub were distillers' grains and solubles. Fat was added using soy acid oil. Nine 105-acre pastures, which consisted of primarily crested wheatgrass (80-85%) with some buffalo and blue gramma grass dispersed throughout the pastures, were used. The nine pastures were arranged in three blocks (three pastures in a block), and one of three treatments was randomly assigned to one pasture within a block. The steers were then rotated within the pasture block every 28 days in an effort to avoid pasture (location) effect on the supplemental treatments.

The steers were weighed on two consecutive days at the initiation and conclusion of the grazing trial and once at 28 day intervals. The first initial weight was used to assign the steers into 10 weight groups from the heaviest nine steers to the lightest nine steers. The heaviest nine steers were then randomly allotted to the nine pastures followed by the next heaviest to the lightest group. After the allotment was complete in each weight group, the nine groups were randomly assigned to the nine pasture groups. All cattle were implanted with Synovex-S and tagged with a fly tag at the initiation of the trial.

Each supplement was weighed weekly and daily average supplement consumption was calculated. Forage samples were hand clipped every 14 days and were analyzed for crude protein, ADF plus other nutrients. Pumped well water was provided from one source in water tanks.

The placement of the tubs and weather vane mineral feeders containing the mineral was varied from the water location and was used to aid in the control of the level of the supplement intake.

Table 1. Performance of summer grazing yearling steers and supplemented with either minerals, protein or protein and fat.

	Supplement ^a		
	Salt/Mineral	Protein	Protein/Fat
No. Steers	30	29	30
No. Pastures	3	3	3
Live weights, lb			
Initial, 5/24	670	659	658
Final - 9/13	822	883	857
ADG, lb			
Period 1 - 28 day	2.91	3.38	3.17
Period 2 - 28 day	1.27	1.68	1.90
Accum. 56 day	2.09	2.53	2.53
Period 3 - 28 day	1.30	1.52	1.26
Accum. 84 day	1.83	2.19	2.11
Period 4 - 28 day	-0.06	1.43	0.76
Overall 5/24-9/13	1.36 ^b	2.00 ^c	1.77 ^d

^aSupplements were: Mineral - commercial mineral; Protein = 40% crude protein - 29% NPN - 19% from biuret; Protein/fat = Protein content is 20% (NPN 6.7%) fat was 20% up to 28 days and then was 15%.
^{bcd}Means with different superscripts are different (P < 0.10).

Finishing Phase

After the cattle had summer grazed for 113 days they were shipped to the Panhandle Research and Extension Center for finishing on a common high grain diet. The final fall weights off of grass were used for the initial weight on feed. Upon arrival they were implanted with Synovex-S and vaccinated with a four-way modified live viral vaccine (IBR, BVD, PI₃ and BRSV) and back poured for external parasites. After 84 days on feed they were implanted with Synovex+. At the end of the finishing period they were weighed just prior to shipping to slaughter. The final finishing weight was determined by dividing final carcass weight by a standard dressing percentage (62).

Results

Grazing Phase

All cattle gained at a very high level the first 56 days of the trial when the forages were of high quality and some compensatory growth was achieved (Table 1). Cattle supplemented with protein only and protein plus fat gained at a higher level than those supplemented with the salt/mineral mix at 28, 56, 84 days and overall on the experiment. Protein alone produced slightly higher gain than the protein fat combination overall, however these differences occurred during the latter part of the grazing period when forages were very low in protein. There were major advantages of the protein supplements during the last 28 days of the experiment (Aug. 16 to Sept. 13) when the average protein content of the clipped grass samples was approximately 4% crude protein (Figure 1). Most likely the cattle selected a diet slightly higher in protein content than the clipped sample, however they still were protein deficient as was evident when no gain was achieved in the salt/mineral control supplement. The protein content of the grass was very low because of lack of rainfall in the late summer and fall of the grazing period. Also, the predominant forage was crested wheat grass, a cool season grass which loses nutrient

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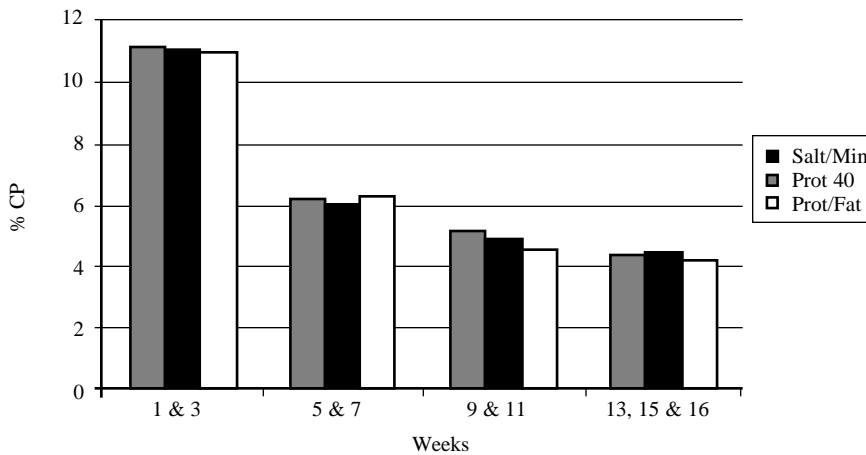


Figure 1. Forage crude protein over time for treatment pastures.

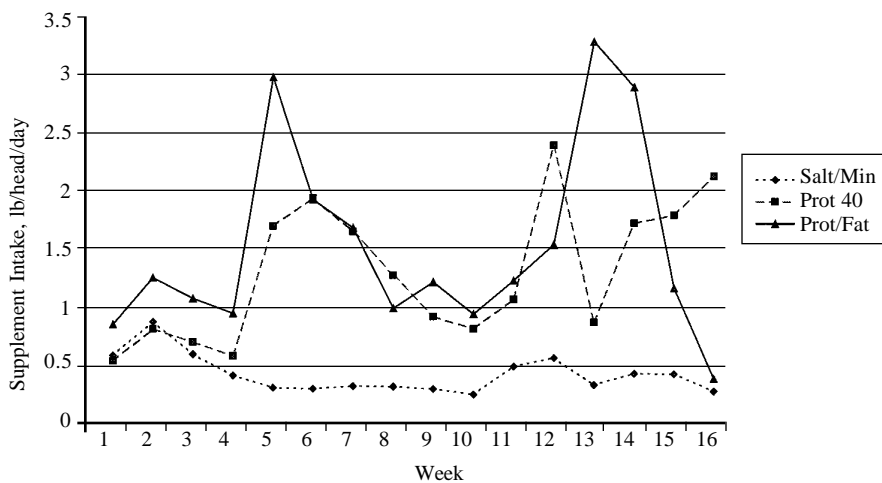


Figure 2. Weekly supplement intake.

content very rapidly after it reaches maturity. Also, the cattle had little ability to select from the forages available as the small amount of warm season grasses were grazed out earlier and only mature crested wheat grass was available. There was considerable quantity of standing forage available the entire grazing period.

Clipped samples of forages were relatively high in protein the first two weeks of grazing (Figure 1) then dropped to 5-6% crude protein on July 5, and afterwards ranged from 4-6% the remainder of the trial. Because considerable green growth was present during midsummer, it is probable that cattle were selecting a higher quality diet than the clipped samples indicated resulting in a smaller magnitude of protein response than was experienced the last 28 day period.

Supplement intake was somewhat variable throughout the trial from week to week. The differences in intake are not totally understood; however, they are very similar to intake variation encountered in these experimental pastures in previous years with various supplements. Initially, the mineral supplement consumption was very high so salt was offered free choice to aid in lowering the consumption of the commercial mineral.

Overall, the consumption of protein tub averaged 1.31 lb/head/day giving a crude protein intake level of 0.52 lb per steer daily. Of the 0.52 lb of crude protein, NPN accounted for 0.38 lb giving 0.14 lb of natural protein supplementation daily. There was a trend for the cattle to consume lower levels of protein in the earlier grazing season and increasing in the latter part (Table 3). The consumption of the combination protein/fat supplement averaged 1.52 lb per steer daily. This provided 0.30 lb of crude protein (0.10 lb from NPN) and approximately .20 lb of supplemental fat daily. The effect fat supplementation had on gain is not certain. It appears the limiting nutrient was protein because the cattle gained faster on the higher protein supplement.

Table 2. Performance of steers finishing on common diet after grazing period.

	Summer Supplement		
	Salt/Mineral	Protein	Protein/Fat
Summer ADG, lb	1.36	2.00	1.77
On feed wt, lb	822	883	857
Finishing weight ^a , lb	1329 ^d	1377 ^e	1376 ^e
Daily gain, lb	3.50	3.41	3.58
DM intake, lb	24.0	24.6	24.3
Feed (DM)/gain	6.86	7.21	6.79
Overall ADG ^b , lb	2.55 ^d	2.79 ^e	2.78 ^e
Carcass Characteristics			
Carcass wt, lb	824 ^d	854 ^e	853 ^e
Dressing percentage	62.5	62.9	62.1
Fat, in	.58	.54	.56
Marbling ^c	4.3	4.5	4.4
Rib eye area, sq in	12.4	12.2	12.6
Percent > Select [†]	63	90	83

^aFinal weights were adjusted to a standard 62 percent dressing percent.

^bDaily gain from starting on grass (May 16 - 113 days) to finish (Feb. 5 - 145 days).

^cMarbling score of 4.0 = small^o.

^{d,e}Means with different superscripts are different (P < 0.010).

Table 3. Supplement intake of summer grazing yearling steers supplemented with either salt/mineral, protein or protein and fat.

	Supplement ^a , lb		
	Salt/Mineral	Protein	Protein/Fat
Consumption			
Period 1	0.63	0.67	1.04
Period 2	0.32	1.64	1.89
Period 3	0.41	1.30	1.23
Period 4	0.37	1.62	1.92
Overall	0.43	1.31	1.52

^aSupplements were: Mineral - commercial mineral; Protein = 40% crude protein - 29% NPN - 19% from biuret; Protein/fat = Protein content is 20% (NPN 6.7%) fat was 20% up to 28 days and then was 15%.

Finishing Phase

Gains in the feedlot were not different for the steers regardless of previous summer gain (Table 2). The cattle previously supplemented with either protein or protein/fat gained at the same rate while on the finishing ration. There was a slight trend (P = 0.29) for the fastest gaining steers on grass that were supplemented with only protein to gain at a slightly lower rate than the other two summer treatment groups and they appeared to be slightly less efficient in feed conversion (P = 0.21). The level of compensation of the control group versus the summer protein supplemented group was only 2.6% which is much lower than found in most other studies. The cattle supplemented with fat and protein gained the same as the control

group in the feedlot even though they came in the feedlot 47 lb heavier.

Overall, from the initiation of the grazing phase to finished weight, cattle supplemented with either protein or protein/fat during the summer gained 59 lb more than the control group and yielded an additional 30 lb of carcass weight. The additional carcass weight could be used to offset the added cost for the summer supplements.

Carcass traits were similar for all treatments. There appeared to be more cattle grading low choice and above for the summer supplemented cattle, however marbling scores were not different.

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