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Energy and Protein Supplementation for Stockers Grazing Bermudagrass Pasture

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Story in Brief

Supplementation strategies for stocker cattle grazing Bermuda pasture during late summer were studied using 45 crossbred fall-born heifers. Experimental treatments were: no supplement (Control), mineral only (Mineral), 5 lb of low starch supplement containing 15% crude protein (HF), 5 lb of high starch supplement containing 15% crude protein (HG), and 2.5 lb of low starch supplement containing 30% crude protein (LF). Three ounces per day of mineral supplied 150 mg monensin as did each of the three supplement treatments at their respective feeding levels. The trial was initiated on July 1 and terminated on September 30, for a total of 91 d. Mineral consumption averaged only 1.5 oz per head daily for the Mineral group, resulting in lower monensin intake compared with supplemented cattle. Weight gains for Control and Mineral fed heifers were not different. Supplemented cattle gained .41 and .73 lb per day more during the first 49 d and second 42 d of the trial, respectively. Weight gain did not differ for cattle receiving HF versus HG supplements. Cattle receiving HF and HG tended to gain faster (1.63 lb per day) compared with cattle receiving LF supplement (1.47 lb per day). Pounds of feed required to achieve one additional pound of weight gain beyond non-supplemented cattle was 8.27, 8.13 and 5.43 for HF, HG and LF, respectively.

(Key Words: Stockers, Supplementation, Bermudagrass.)

Introduction

Declining forage quality during late summer months often results in reduced performance of grazing cattle. Previous research has shown that high protein supplement increases intake and digestibility of prairie hay harvested during mid summer (Guthrie et al., 1984). Furthermore, daily gains of stocker cattle grazing bermudagrass pastures during late summer was increased by more than 30% when supplemented with 1 lb per day of soybean meal (Cantrell et al., 1985). Feeding greater amounts of energy in combination with supplemental protein should increase weight gain during the later summer grazing period. However, research suggests that energy supplements based on feedstuffs high in starch, such as grain, reduces forage digestibility (Chase and Hibberd, 1985) compared with energy supplements formulated with highly digestible fiber sources, such as corn gluten feed or soybean hulls (Hibberd et al., 1986). This study was conducted to determine the feasibility of supplementing additional energy, and to compare supplemental energy sources for stocker cattle grazing bermudagrass pasture during late summer.

Materials and Methods

Forty-five fall born Angus and Angus x Hereford heifers (initial weight = 565 ± 8 lb) were used in a completely random design to study the effects of energy source and protein supplementation on summer weight gain. Heifers grazed a 22-acre bermudagrass pasture from July 1 through September 30 (91 days). The cattle were weighed and treated with EprinexÔ on June 24 and randomly assigned to one of five supplementation treatments (Table 1). Treatments consisted of: 1) no supplement (Control), 2) 3 oz per head per day of a mineral mixture with 50 mg monensin per ounce (Mineral), 3) 5 lb per head per day digestible fiber energy supplement (15% CP) with 30 mg monensin per lb (HF), 4) 5 lb per head per day grain based energy supplement (15% CP) with 30 mg monensin per lb (HG), and 5) 2.5 lb per head per day digestible fiber supplement (30% CP) with 60 mg monensin per lb (LF). On July 1, heifers were re-weighed, tagged according to treatment assignment and supplementation was initiated. Interim and final weights were recorded on d 49 and d 91, respectively. All weights were recorded after overnight (15 h) removal from feed and water. The pasture was fertilized with 100 lb N per acre and sprayed with herbicide on May 15. Forage availability was excellent to adequate throughout the experiment with estimated forage dry matter of 3,482 lb per acre on

July 1 and 2,683 lb per acre on September 30. Supplements were prorated for 6 d per week feeding. Each heifer was individually supplemented in a feeding barn located adjacent to the bermudagrass pasture. Data were analyzed for a completely random design. Preplanned comparisons among treatments were made using orthogonal contrasts.

Results and Discussion

Supplement Consumption. Due to insufficient initial consumption of the Mineral treatment, 3 oz of mineral was mixed with .5 lb cottonseed hulls to encourage mineral consumption. However, consumption of the Mineral treatment remained low and inconsistent. In free ranging animals, mineral supplements are offered on a free choice basis. These animals were offered mineral supplements in individual stalls for only 1 h per day. This method was necessary to individually feed animals while allowing them to graze the same pasture. Offering the supplement, in a confined setting for a short time was likely responsible for low mineral intake. Average mineral intake was estimated to be 1.5 oz per day. HF, HG and LF supplements were generally consumed within 30 min.

Weight Gain. Weight gain did not differ throughout the experiment between Control and Mineral fed heifers (Table 2). This is likely due to the insufficient and inconsistent consumption noted for the Mineral treatment, resulting in inadequate monensin intake. Daily gain was significantly less ($P<.01$) for non-supplemented cattle (Control and Mineral) compared with cattle receiving a supplement (1.18 vs 1.59 during Period 1 and .82 vs 1.55 during Period 2). Rate of weight gain did not differ between the two energy sources (HF and HG, $P>.1$). Overall weight gain for cattle fed HF and HG supplements was greater ($P=.1$) compared with LF fed heifers.

Supplement Conversion. Pounds of feed required to achieve one additional pound of weight gain beyond non-supplemented cattle was 8.27, 8.13 and 5.43 for HF, HG and LF, respectively.

Actual vs Predicted Response to Supplement. The 1996 beef cattle NRC was used to compare actual and predicted response from each supplement (Table 3). The following procedure was used:

1. Mean weight during the experiment was calculated and entered for each treatment group based on actual data.
2. Mean body condition score was 5.0.
3. Environmental conditions were adjusted to reflect actual mean temperature and wind speed or estimated heat stress and hair coat conditions.
4. Management code for ionophore feeding was changed for supplemented cattle to reflect monensin intake.
5. Forage digestibility was adjusted until predicted and actual weight gain was identical for non-supplemented cattle (Control). Metabolizable protein supply was assumed to be adequate to support energy allowable gain.
6. Actual supplement dry matter intake and tabular supplement digestibility values were entered for each treatment.
7. Forage intake was adjusted until dry matter intake equaled predicted dry matter intake.
8. Predicted weight gain was recorded.
9. Forage digestibility (TDN) was adjusted until predicted ADG was identical to actual ADG. Metabolizable protein supply was assumed to be adequate for each treatment group.

Predicted response from supplement was very similar to actual response. Minor adjustments in forage digestibility were needed to match predicted weight gain with actual weight gain of cattle receiving supplements. This would suggest that supplements had minimal influence on forage digestibility, assuming forage intake predictions are reasonable. The model predicted a

31% decrease in forage intake when cattle were supplemented with .7% of body weight HF and HG. When cattle were fed .35% LF, the model predicted a 15% reduction in forage intake. Average estimated replacement rate of supplement for forage was .96. Logically, actual forage intake, digestibility and metabolizable protein supply would need to be measured in order to determine the accuracy of these predictions and/or assumptions.

Literature Cited

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Acknowledgment

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Table 1. Supplement composition and nutrients supplied[a].

Item	HF	HG	LF
	Amount per day		
Dry matter, lb	4.5	4.5	2.25
Crude protein, lb	.75	.75	.75
TDN, lb	3.29	3.35	1.67
NEm, Mcal	3.67	3.85	1.80
NEg, Mcal	2.42	2.43	1.20
Monensin, mg	150.0	150.0	150.0

[a]HF = high fiber with monensin (15% crude protein), HG = high grain with monensin (15% crude protein), LF = low fiber with monensin (30% crude protein).

Table 2. Influence of energy source and protein supplementation on weight gain of heifers grazing bermudagrass pastures during summer.

	Treatment[a]					Contrast[b]			
Item	Control	Mineral	HF	HG	LF	Cont vs Mineral	Non-sup vs Sup[c]	HF vs HG	HF and HG vs LF
N	9	9	9	9	9				
Initial weight, lb	559	559	565	563	579	NS	NS	NS	NS
Period 1 ADG, 49 d	1.31	1.05	1.64	1.57	1.55	NS	.001	NS	NS
Period 2 ADG, 42 d	.70	.93	1.59	1.69	1.37	NS	.0001	NS	NS
Overall ADG, 91 d	1.03	1.00	1.62	1.63	1.47	NS	.0001	NS	.10

[a]Control = no supplement, Mineral = hand fed mineral with monensin, HF = high fiber with monensin (15% crude protein), HG = high grain with monensin (15% crude protein), LF = low fiber with monensin (30% crude protein).
[b]Values in the table represent probabilities associated with each contrast indicated. NS = P>.10.
[c]Control and Mineral versus HF, HG and LF.

Table 3. Actual vs predicted response to supplement[a].				
	Control	HF	HG	LF
Average weight	605	639	637	646
Actual supplement DM intake	-	4.5	4.5	2.25
Estimated forage DM intake				
Lb per day	13.4	9.83	9.79	12.2
Percent of body weight	2.22	1.54	1.54	1.89
Unadjusted forage TDN, %	59.3	59.3	59.3	59.3
Predicted ADG	1.03	1.62	1.65	1.45
Adjusted forage TDN, %	-	59.3	59.0	59.6
Adjusted ADG, lb	-	1.62	1.63	1.47

[a]Forage intake, digestibility and average daily gain predicted using 1996 Beef Cattle NRC Model, Level 1.

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