Protein Supplements for Stocker Calves Grazing Coastal Bermudagrass Pastures

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Summary

Fall-born, Simmental crossbred calves were weaned in early June and grazed on bermudagrass pasture until early October. In addition to a pasture only treatment, calves received ad libitum access to each of five different protein supplements. Average daily gain (ADG) of calves receiving only pasture was 1.03 lbs and represents a near-normal gain for this fat-conditioned, fall-born calf. Two condensed molasses blocks produced nearly identical calf ADG of 1.2 lbs. A dry formulation of the molasses block produced ADG of 1.5 lbs; however, supplement consumption was increased more than 4-fold. A fishmeal pellet containing monensin and consumed at 1.12 lbs per day produced calf ADG of 1.92 lbs. Although forage protein values were above-normal for this grazing period, animal performance was significantly improved with relatively small amounts of daily protein supplement. Thus, biologically, protein supplements showed to be a positive stimulation of gain for stockers grazing bermudagrass during the mid- to late-summer period.

Introduction

Poor weight gains (< 1 lb/day) from beef calves grazing warm-season perennial grasses suggest a possible protein or energy deficiency. Forage protein has been reported to be degraded to a large extent in the rumen. Therefore, a supplement such as fishmeal which has been reported to be resistent to rumen degradation and essentially "by-passes" the rumen to the other stomach compartments, may increase daily gain of grazing calves. Lysine and methionine may also be limiting growth since microbial protein has been shown to below in these indispensible amino acids. There has long been interest in limiting daily intake of pasture supplements by incorporating them into condensed molasses blocks. The molasses block limits intake due to its physical and chemical form instead of using innutritious ingredients such as salt. The objectives of this grazing study were: 1) to determine the influence of source and level of supplemental protein on performance of growing beef calves grazing Coastal bermudagrass pastures, and 2) to evaluate the condensed molasses block as a method of limiting daily supplement intake.

Procedure

Seventy-two fall-born, ½ Simmental x ¼ Hereford x ¼ Brahman steers (n = 36) and heifers (n = 36) were weaned on June 11, 1986. Each calf was weighed and measured for rump fat thickness (RFT) via ultrasound

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device. They were blocked by sex and allotted by weight (average 650 lbs) and visual condition score (VCS) to the following six treatments: (1) Coastal bermudagrass pasture with free-choice mineral (PAS); (2) PAS plus a 31.6 percent crude protein (CP), commercially available condensed molasses block containing fish solubles, cottonseed meal, blood meal, meat scraps, and urea as protein sources (PDQ); (3) PAS plus a 32.5 percent CP condensed molasses block containing Menhaden fishmeal, fish solubles, and urea as sources of protein (FMB); (4) PAS plus a 34.2 percent CP dry supplement containing cottonseed meal, fish solubles, urea, and meat scraps as protein sources (DPDQ); (5) PAS plus a 30.7 percent CP dry protein supplement composed of DPDQ containing 1.3 percent rumen-stable methionine (RSmet) and 1.7 percent rumen-stable lysine (RSlys) (AA); and (6) PAS plus 37.2 percent CP dry supplement containing Menhaden fishmeal and monensin (FM).

Calves were allotted by treatment to six feedlot pens and fed ad libitum bermudagrass hay. Calves assigned to PDQ and FMB treatments were given ad libitum access to their respective supplements, while calves allotted to DPDQ, AA, and FM were given 1 lb/hd/day of their respective supplements for 7 days. Calves assigned to the PAS treatment were fed corn at 2 lbs/hd/day and cottonseed meal at one half lb/hd/day during this weaning, drylot period. On June 18, 1986, all calves were implanted with Ralgro, weighed, visually condition-scored (VCS), and placed on Coastal bermudagrass pasture to begin a 7-day pasture-treatment adjustment period to allow the calves to adjust to the forage and supplements. All calves were reweighed on June 25, 1986 to initiate the weight gain-protein supplement trial.

Each treatment was replicated with six steers (Rep 1) and six heifers (Rep 2). Individual replicates of PDQ, FMB, and FM were group fed; whereas, Rep 1 and Rep 2 of DPDQ and AA were combined and fed via Pinpointer 4000 and Pinpointer 5000, respectively, to determine individual daily supplement intake. The trial consisted of two 3.6-acre pastures (DPDQ and AA), six 1.8-acre pastures (PDQ, FMB, and PAS), and two 3.0-acre pastures (FM). All supplements were fed ad libitum. The ingredient composition of each supplement is presented in Table 1. The AA supplement contained RSmet and RSlys which has a polymer coating that is stable at rumen pH (5.4) but unstable at abomasal pH (2.9).

Calves were weighed on June 25 (d-1), July 23 (d-28), August 20 (d-56), September 17 (d-84), and October 13, 1986 (d-110) to detect changes in average daily gain (ADG) throughout the trial. On October 13, each calf was given a final weight, VCS, and rump fat thickness.

Pastures were fertilized with 66 lbs N/A at 4-week intervals. To equalize forage-on-offer across treatments at initiation of the trial, all pastures were shredded to an average height of 7 to 8 inches on June 24, 1986. Forage-on-offer was monitored closely by visual observation and monthly dry matter pasture samples. Pasture samples were taken by hand-clipping four, 1-ft square areas to ground level. Each sample was intended to represent one quarter of the pasture. The average level of forage-on-offer at initiation and termination of the trial was 205 and 170 lbs of dry matter per 100 lbs of live bodyweight, respectively (Table 2). Although FM tended to have more forage-on-offer throughout the grazing period, all treatments had more than adequate forage to allow selective grazing and ad libitum intake. These grazing pressures, or stocking rates, would be classified as light or very conservative for this region of the state.

Forage samples for chemical analysis were taken biweekly by hand-picking portions of the sward which visually represented similar portions selected by the animals. Crude protein levels of the forage ranged from approximately 11 to 20 percent during the grazing period (Table 3).

TABLE 1. FORMULATION OF PROTEIN SUPPLEMENTS USED WITH CALVES GRAZING BERMUDAGRASS PASTURES

	PDQ[1]	FMB[2]	DPDQ[3]	AA[4]	FM[5]
Cane molasses	66.98	67.05	4.26	4.26	—
Soy oil	.71	.71	—	—	—
Lecithin	1.36	1.36	—	—	—
Urea	6.49	6.50	2.13	2.13	—
Hydrated lime	.97	.97	—	—	—
Trace minerals	.97	.97	.21	.21	.25
Fish solubles	1.95	1.95	1.70	1.70	—
Vitamin A, D, & E	.28	.20	—	—	—
Dical phosphate	4.37	4.37	2.13	2.13	—
Cottonseed meal	11.92	—	34.04	34.04	—
Meat scraps	3.18	—	8.51	8.51	—
Blood meal	.80	—	—	—	—
Fishmeal (Menhaden)	—	15.90	—	—	48.50
Wheat midds	—	—	21.28	21.28	—
Milo meal	—	—	7.45	4.47	—
Calcium carbonate	—	—	2.13	2.13	—
Ammonium sulfate	—	—	.21	.21	.25
Vegetable fat	—	—	1.06	1.06	—
Salt	—	—	14.89	14.89	2.94
Rumen-stable methionine	—	—	—	1.28	—
Rumen-stable lysine	—	—	—	1.70	—
Cane molasses (dehyd)	—	—	—	—	2.88
Rumensin 60	—	—	—	—	.15
Magnesium oxide	—	—	—	—	.74
Cottonseed hulls	—	—	—	—	27.00
Wheat mill run	—	—	—	—	11.34
% Crude protein	31.6	32.5	34.2	30.7	37.2

[1]PDQ = Commercially available, condensed molasses block.
[2]FMB = Specially formulated condensed molasses block.
[3]DPDQ = Specially formulated dry protein supplement.
[4]AA = Specially formulated dry protein supplement with rumen-stable amino acids.
[5]FM = Specially formulated dry fishmeal pellet containing monensin.

TABLE 2. AVAILABLE FORAGE IN EACH TREATMENT PASTURE EXPRESSED AS POUNDS DRY MATTER (DM) PER 100 POUNDS BODY WEIGHT (BW)

Treatment	Date					
	6/27	7/25	8/25	9/19	10/11	Avg.
	Pounds DM/100 Pounds BW					
PAS	194	176	197	162	138	174
PDQ	191	218	189	252	197	209
FMB	188	220	152	194	125	176
DPDQ	130	139	220	170	139	160
AA	242	185	197	192	136	190
FM	280	333	263	309	287	294
AVG.	205	212	204	213	170	201

TABLE 3. PERCENT CRUDE PROTEIN OF BERMUDAGRASS PASTURES THROUGHOUT THE GRAZING PERIOD

Treatment	Date						
	6/27	7/11	7/25	8/12	8/25	9/19	10/11
	Percent						
PAS	15.4	16.0	12.4	20.9	18.0	18.7	18.1
PDQ	14.8	16.3	12.8	19.6	18.6	17.1	17.7
FMB	16.0	16.8	12.8	19.3	20.4	16.7	20.1
DPDQ	15.4	18.5	13.5	20.6	17.9	18.9	19.3
AA	15.5	14.6	11.3	19.3	17.6	17.7	18.9
FM	15.2	17.7	14.4	20.0	16.7	18.0	18.1

TABLE 4. AVERAGE DAILY GAIN, CONSUMPTION OF SUPPLEMENT, AND CONVERSION RATIOS OF PROTEIN SUPPLEMENTS FED TO CALVES GRAZING BERMUDAGRASS PASTURES

Average Treatment	Average Daily Gain	Average Daily Consumption	Increased Gain	Supplement: Increased Gain Ratio
	Pounds			lb:lb
PAS	1.03d	0	0	0
PDQ	1.22cd	.43	.19	2.26
FMB	1.20cd	.45	.17	2.65D
DPDQ	1.51b	1.92	.48	4.00
AA	1.40bc	2.21	.37	5.97
FM	1.92a	1.12	.89	1.25

TABLE 5. VISUAL CONDITION SCORE (VCS) AND RUMP FAT THICKNESS (RFT) MEASURED VIA ULTRASOUND OF CALVES GRAZING BERMUDAGRASS

Treatment	RFT (d-0)	RFT (d-110)	VCS (d-110)
	Inches		
PAS	.26	.12	5.5
PDQ	.31	.13	5.6
FMB	.33	.12	5.6
DPDQ	.31	.15	5.9
AA	.31	18	6.0
FM	.20	.14	5.8

Results

Calves assigned to FM had ADG of 1.92 lbs which was significantly higher ($P < .01$) than the ADG of PAS (1.03), PDQ (1.22), FMB (1.20), DPDQ (1.51), and AA (1.40) (Table 4). The ADG for calves on AA and DPDQ were not different ($P < .01$) from each other but were higher ($P < .01$) than PAS. There was an increase in gain due to the protein supplement but no effect due to the RSlys and RSmet (AA). At the level of consumption obtained in this trial, PDQ and FMB did not increase calf ADG over that of PAS. Forage protein content was above-normal for the summer period due to a reasonably well-distributed rainfall pattern and additions of nitrogen fertilizer at monthly intervals. Thus, the level of protein available in the forage may have restricted some of the potential gains anticipated from the supplements. The ad libitum, average daily consumption of PDQ, FMB, DPDQ, AA, and FM was .43, .45, 1.92, 2.21, and 1.12 lbs, respectively (Table 4). The condensed molasses blocks (PDQ and FMB) proved to be an effective method of limiting daily intake of protein supplements. Increased gain from a supplemented treatment is the increase in ADG obtained from a protein supplemented group over that of the PAS group. The increased gain for PDQ, FMB, DPDQ, AA, and FM was .19, .17, .48, .37, and .89 lbs, respectively (Table 4). Assuming the protein supplement did not influence forage utilization (intake or digestibility), the supplement:gain ratio describes the feed efficiency for each supplemented group. The supplement:increased gain ratio for PDQ, FMB, DPDQ, AA, and FM was 2.26, 2.65, 4.00, 5.97, and 1.25, respectively (Table 4). Except for AA, whose conversion ratio approached the range of values considered to be a normal feedlot efficiency for beef cattle, each supplemented group had an exceptionally low feed efficiency for increased gain which indicated an increased efficiency of forage utilization or an increased efficiency of protein utilization. Data collected by feeding DPDQ via Pinpointers did not produce significant correlations between consumption of supplement and ADG. Rump fat thickness and visual condition scores were not different ($P < .01$) at initiation or termination of the 110-day grazing period (Table 5).

Although results indicated that bermudagrass pastures were nutritionally deficient for maximum weight gain by growing beef calves, it cannot be determined from this trial if the increased ADG was directly due to the dietary protein being delivered to the small intestines for use at the tissue level, if the dietary protein was utilized as energy, or if the efficiency of microbial protein production was enhanced. Extremely low supplement:gain ratios usually indicate an increased forage utilization.