IMPACT OF INCREASING AMOUNTS OF SUPPLEMENTAL HIGH-PROTEIN SOYBEAN MEAL ON PERFORMANCE OF RANGE BEEF COWS [1]

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Summary

One hundred and twenty spring-calving Hereford × Angus cows grazing low-quality, tallgrass-prairie forage were fed 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, or 6.0 lb soybean meal (SBM) per head daily. SBM as a source of supplemental degradable intake protein (DIP) can be effective in maintaining cow body weight and body condition during the winter grazing season. Performance as measured by changes in body weight and condition score was maximized when cows received approximately 3.5 to 3.8 lb/day. Below this level, cows lost about 48 lb (about .4 units of BCS) for every 1 lb decrease in the amount of supplemental SBM. The effect of amount of supplemental SBM on calf performance was minimal.

(Key Words: Range Cows, Forage, Soybean Meal.)

Introduction

Protein supplementation to beef cattle grazing low-quality, tallgrass-prairie forage has been a long-standing practice. However, in recent years, the mechanisms by which that protein is utilized have become more clear. We now classify the protein that is degraded by microbes in the rumen as degradable intake protein (DIP) and the protein that escapes ruminal degradation and passes through the rumen to the small intestine without being altered as undegradable intake protein (UIP).

Research at Kansas State University demonstrates that DIP is the first-limiting nutrient for optimal intake and utilization of low-quality forage. However, that research was conducted by supplementing DIP in a purified form (sodium caseinate). Applying that research under production conditions requires identification of potential protein supplements that are high in DIP. Soybean meal (SBM), in which 66% of the protein is DIP, is a good candidate.

The objectives of this study were to identify the level of SBM that elicits maximum performance response and to define the rate of performance decline below the maximum response.

Experimental Procedures

A performance study was conducted during winter 1996-97 to evaluate the impact of level of supplemental SBM on body weight, body condition, and pregnancy rate of spring-calving beef cows grazing low-quality, tallgrass-prairie forage. Forage samples clipped from the pastures contained 76% NDF and 2.7% CP, with 49% of the CP as DIP. DIP was estimated using a single-point enzyme assay. The SBM was 10.1% NDF and 53.9% CP, with 66% of the CP as DIP (1996 Beef NRC). One hundred and twenty Hereford × Angus cows (average initial body weight, 1141 lb; average initial body condition score, 5.3) were allotted randomly to one of three pastures. Within each pasture, cows were assigned to one of eight levels of supplemental SBM; 1.0, 1.5, 2.0, 2.5, 3.0, 4.0,

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5.0, and 6.0 lb/head/day as-fed. Cattle in each pasture were gathered daily, sorted into their respective treatments, group-fed their supplement, and then returned to pasture. The treatment period began December 2, 1996 and was terminated on February 10, 1997, which was the first day of the calving season. After the calving season began, all cows were fed 3.8 lb/head/day until they calved. Following parturition, cows were fed 10 lb/head/day of alfalfa until sufficient new grass growth was available in the spring. Body weight and condition were measured at approximately 1-month intervals until the beginning of the calving season. Thus, measurements were obtained on December 2, January 6, and February 10, with additional measures postcalving (within 48 h after calving), shortly before the beginning of the breeding season (May 8), and at weaning (October 1). Cows were bred by natural service to Angus bulls.

Results and Discussion

Losses in cow body weight (BW) and body condition score (BCS) through the beginning of the calving season (Table 1) were reduced (linear P<.01) by increasing the level of supplemental soybean meal (SBM); however, both BW and BCS showed a clear plateau (quadratic P<.01). Maximal BW response to supplemental SBM was achieved at approximately 3.5 lb/head/ day, and BCS response was maximized at approximately 3.8 lb/head/day. Feeding SBM above these levels yielded no further reduction in BW or BCS loss. Below this point of maximal response (3.5 to 3.8 lb SBM/head/day), each 1 lb decrease in SBM fed daily resulted in a 48 lb reduction in BW and a .4 unit decrease in BCS.

The level of SBM fed from the beginning of the winter grazing season until the beginning of the calving season had no affect on calf birth date (Table 2; P>.52) or calf average daily gain (P>.43). However, there was a trend for level of supplemental SBM to affect calf birth weight (linear P=.14; quadratic P=.16) and weaning weight (quadratic P=.12). Pregnancy rate not influenced significantly (P=.51).

Knowledge of the amount of supplemental SBM at which performance is maximized and the rate of decline below that maximum can be used as a rough guideline for determining the amount of supplemental SBM necessary to achieve a specified level of BW or BCS change in spring-calving beef cows grazing winter range.

Table 1. Effects of Increasing Amounts of Supplemental Soybean Meal (SBM) on Cumulative and Period Body Weight (BW) and Condition Score[a] (BCS) Change, Pregnancy Rate, and Calf Performance of Beef Cows Grazing Dormant, Tallgrass-Prairie Forage

	Supplemental SBM, lb									
Item	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	SEM	Contrasts[b]
No. of cows	15	15	15	15	15	15	15	15		
Initial BW, lb	1138	1152	1136	1153	1125	1137	1132	1160	27.6	NS
Period BW change, lb										
2 Dec - 6 Jan	-60	-43	-31	-21	-8	-2	4	8	8.5	L, Q
7 Jan - 10 Feb[c]	-49	-16	-15	-13	11	15	17	30	6.7	L, Q
11 Feb - 8 May[d]	-146	-166	-184	-199	-210	-226	-244	-232	15.3	L, Q
8 May - 1 Oct[e]	259	238	261	192	198	216	213	173	19.1	L
Cumulative BW change, lb										
2 Dec - 10 Feb	-255	-212	-193	-201	-185	-140	-162	-	13.6	L, Q
2 Dec- 8 May	-255	-266	-228	-224	-206	-209	-223	-	18.0	L
2 Dec - 1 Oct	3	31	32	-32	-8	7	-10	-23	19.5	NS
Initial BCS	5.28	5.22	5.28	5.17	5.33	5.22	5.30	5.3	.15	NS
Period BCS change										
2 Dec - 6 Jan	-.82	-.58	-.75	-.45	-.18	-.23	-.15	-.23	.095	L, Q
7 Jan - 10 Feb	-.42	-.15	-.17	-.08	-.17	.17	.07	.25	.097	L
11 Feb - 8 May	-.33	-.50	-.43	-.43	-.38	-.77	-.73	-.91	.108	L
8 May - 1 Oct	1.21	1.15	1.24	.93	.63	.70	.78	.73	.133	L
Cumulative BCS change										
2 Dec - 10 Feb	-1.23	-.74	-.86	-.53	-.35	-.07	-.08	.02	.099	L, Q
2 Dec - 8 May	-1.58	-1.23	-1.29	-.98	-.73	-.83	-.82	-.93	.135	L, Q
2 Dec - 1 Oct	-.28	0	-.05	0	-.10	-.13	-.03	-.22	.121	NS
% Pregnant[f]										
rate, %	93	93	93	100	87	93	93	87	-	-
Birth wt, lb	84.4	83.1	83.2	89.3	88.3	85.3	93.6	84.	3.1	NS
Weaning wt, lb	513	489	512	537	519	527	515	503	17.8	NS
Calf ADG[g], lb	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0	.1	NS

[a]Body condition scale: 1=extremely emaciated; 9=extremely obese.
[b]L=linear P<.05; Q=quadratic P<.05; NS=Not significant.
[c]10 February=calving.
[d]8 May=breeding.
[e]1 October=weaning.
[f]Chi-square P=.51.
[g]ADG=average daily gain; calculated as (weaning weight-birth weight)/age at weaning.