SOYBEAN HULLS FOR GROWING BEEF CATTLE

C.A. Hibberd[1], F.T. McCollum[1] and R.R. Scott[2]

Story in Brief

Soybean hulls were included in the diets of growing cattle to evaluate their effect on cattle performance. In experiment 1, a soybean hull supplement was compared to a corn-based supplement for 550 lb replacement beef heifers grazing native range. Heifers fed the corn supplement were only 7.5 lb heavier than the heifers fed the soybean hull supplement by the end of the 89-day trial. In experiment 2, growing cattle fed a ration containing 98.5% soybean hulls gained 1.40 lb/day and converted 9.8 lb feed/lb gain. Including 30% ground milo in the diet improved daily gain (1.59 lb/day) and feed conversion (8.6 lb feed/lb gain). Furthermore, the addition of ground milo reduced the frequency and severity of ruminal distension. These studies indicate that soybean hulls can be a useful feed source for growing beef cattle.

(Key Words: Soybean Hulls, Corn, Supplement, Beef Cattle.)

Introduction

Soybean hulls are a byproduct of the soybean milling industry and could recently be purchased for $60 to $80 per ton. They are moderate in crude protein (average 12.1%) and energy (65% TDN, .39 Mcal NE_g/lb). Their energy content is derived primarily from the fiber component of the feed (67% NDF) which is unlignified (2% lignin) and thus, highly digestible.

Because of the nutritional and chemical characteristics of soybean hulls, they may be efficiently utilized in feeding programs for ruminants. Stocker cattle operators with surplus cattle or a shortage of wheat pasture frequently require an inexpensive substitute for forage. Soybean hulls may provide a suitable alternative to maintain cattle performance when forage supplies are inadequate. Grain-based supplements decrease digestibility and intake of roughages because of starch effects on rumen function. Range supplements formulated with soybean hulls may enhance forage utilization because their energy content is in the form of digestible fiber. The objectives of this study were to evaluate the performance of growing cattle fed soybean hulls in 1) range supplements and 2) complete rations.

Materials and Methods

Experiment 1: Forty Angus X Hereford replacement heifers (average weight 551 lb) were maintained on native grass pastures for 89 days. Heifers were randomly alloted to two supplements primarily composed of either corn or soybean hulls (table 1). Pelleted supplements were group-fed at a daily rate of 4 lb (DM) to provide approximately 1 lb of supplemental crude protein each day. Heifers received their weekly

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[1]Assistant Professor [2]Graduate Assistant

Table 1. Ration composition, nutrient analysis and nutrient supply of soybean hull rations for growing cattle (DM basis).

	Supplement (Trial 1)		Ration (Trial 2)	
	Soyhulls	Corn	Soyhulls	Blend
Feed composition, %				
Soybean meal	30.57	33.50	---	---
Soybean hulls	66.14	---	98.5	70.0
Ground corn	---	61.58	---	---
Ground milo	---	---	---	28.8
Dicalcium phosphate	1.29	.71	1.0	.7
Limestone	---	1.21	---	---
Potassium chloride	.75	1.77	---	---
Trace mineralized salt	1.25	1.23	.5	.5
Vitamin A	.03	.033	.0073	.0073
Nutrient composition, %				
Crude protein[a]	27.32	22.54	14.1	12.9
TDN[b]	68.1	82.9	63.0	67.8
Calcium[b]	.70	.70	.70	.51
Phosphorus[b]	.60	.60	.40	.40
Intake, lb/d				
Total dry matter[a]	3.96	4.02	---	---
Crude protein[a]	1.08	.91	---	---
TDN[b]	2.70	3.33	---	---
Vitamin A, IU/d	18,000	18,000	13,800	13,800

[a]Actual analysis.
[b]Estimated from NRC., 1984.

allotment of supplement (28 lb) on 5 consecutive days, Monday through Friday (5.6 lb of supplement per feeding). Heifers were weighed every 2 weeks after an 18-hour shrink. After weighing, pastures were rotated to minimize pasture effects.

Experiment 2: Twenty-eight growing beef calves (average weight 443 lb) were allocated by weight, breed (Hereford and Hereford X Angus) and sex to two soybean hull rations (table 1). One ration was composed of soybean hulls plus minerals while ground milo (28.8%) was added to the second ration. Rations were fed free choice in a self-feeder. Feed consumption was determined every two weeks and fresh feed added. Cattle were weighed at the beginning and end of the 56-day trial after a 16-hour shrink. All cattle were evaluated for bloat twice daily (0 = no visible signs of bloat; 1 = slight distension of left side; 2 = marked distension of left side; 3 = left and right side distended). Data from both experiments were subjected to least squares analysis and differences between treatments detected by F-test.

Results and Discussion

Experiment 1: Replacement beef heifers maintained on native grass pastures and fed the corn-based supplement gained only 7.5 lb more ($P<.21$) body weight than heifers fed the soybean hull supplement during the 89-day experiment (table 2). Although the soybean hull supplement supplied only 82% as much TDN (table 1) as the corn supplement, both groups of heifers performed similarly.

Table 2. Effect of corn vs soybean hull supplements on weight gain of growing replacement heifers grazing native grass.[a]

Item	Supplement		SEM[b]
	Soyhulls	Corn	
Number of heifers	20	20	---
Initial weight, lb	551	551	---
Final weight, lb	646	653	4.1
Total gain, lb	94	102	4.1
Daily gain, lb/d	1.06	1.14	.046

[a]Least square means.
[b]Standard error of the mean.

This experiment indicates that soybean hulls are roughly equivalent to corn when added to range supplements. Perhaps the starch component of the corn supplement decreased forage digestibility to the extent that the efficiency of diet utilization was decreased. Actual corn intake was 2.5 lb/day, a level that could decrease forage utilization. The soybean hulls, in contrast, may have provided a noncompetitive supplement for the forage that could complement or perhaps stimulate fiber digestion.

Experiment 2: Growing beef cattle fed soybean hulls gained 1.40 lb/day during the 51-day trial (table 3). Although this level of performance would probably be marginal for profitability in a stocker operation, it is better than would be expected when forage supplies are short. Adding about 30% ground milo to the diet increased daily gain of the cattle by .19 lb/day ($P<.28$). Feed consumption averaged 13.8 lb/day for both groups (2.6% of body weight on a dry matter basis). Cattle fed soybean hulls converted 9.8 lb feed/lb of gain. Adding 30% milo to the diet improved feed conversion to 8.6 lb feed/lb of gain.

Table 3. Effect of soybean hull rations on weight gain and bloat score of growing beef cattle[a].

Item	Ration		SEM[b]
	Soyhulls	Soyhull-milo	
Number of cattle	14	14	
Weight, lb			
Initial	443	443	---
Final	515	525	6.1
Gain, lb			
Total	72	81	6.1
Daily	1.40	1.59	.120
Feed			
Intake, lb/day	13.8	13.8	.60
Conversion, lb feed/lb gain	9.8	8.6	.70
Bloat observations			
Days of bloat	12.0	7.7	2.37
Bloat score[c]	.72	.57	.071

[a]Least square means.
[b]Standard error of the mean.
[c]Bloat scoring system: 0 = no visible signs of bloat; 1 = slight distension of left side; 2 = marked distension of left side; 3 = left and right side distended.

Because bran feeds such as soybean hulls swell and ferment rapidly, effects of soybean hulls on bloat were evaluated. Cattle fed soybean hulls averaged 12 days of observable bloat during the 51-day trial (table 3). On days when bloat was observed, the average bloat score was .72 which is equivalent to a slight ruminal distension. Adding milo to the ration decreased the frequency ($P<.21$) and severity of bloat ($P<.14$). The "bloat" that was observed in this study appeared to be a slight ruminal distension probably attributable to the swelling capacity of bran (soybean hulls soaked in water will double their volume in one hour). During the entire study, only one animal was distended to the extent that poloxalene was administered. Producers should not be surprised if their cattle exhibit some ruminal distension when large amounts of soybean hulls are fed.

These studies illustrate that soybean hulls can be a useful component of cattle diets. In contrast to cereal grains, digestible fiber feeds such as soybean hulls may enhance forage utilization when used in range supplements. As the major component of the diet, soybean hulls will support an intermediate level of gain (1.40 lb/day) providing an alternative for periods of inadequate forage supply. If soybean hulls sell for $80/ton, feed costs would be about 40¢/lb of gain for this program. Adding some grain to the diet may increase cattle performance and decrease the severity of ruminal distension. For growing cattle, soybean hulls provide a practical alternative to other feedstuffs when prices justify their use.