2000 Animal Science Research Report

Pages 50-54

Effects of Hay and Protein Supplementation on Performance of Growing Steers Fed Pelleted Soybean Hulls

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Story in Brief

An experiment was conducted using 78 crossbred steers (420 lb initial BW) to evaluate the effects of hay and(or) protein supplementation on a pelleted soybean hull diet. Steers were allotted by weight to one of three dietary treatments (five pens/trt of five or six steers/pen). Dietary treatments were: 1) ad libitum access to soybean hulls (CON), 2) CON plus 2 lb/hd/d of 32% protein supplement (SUP), and 3) SUP plus 1.5 lb/hd/d long stem prairie hay (SUPHAY). Soybean hulls contained 11.6% CP, 69.8% NDF, and 44.1% ADF (dry matter basis). Beginning on d 21, there was a high frequency of a gas type bloat. Daily gain and feed intake were increased by the addition of protein supplement and further increased with hay supplementation. Feed efficiency was improved by supplement, however no further improvement by the addition of prairie hay was noted. Frequency of cattle bloating and severity of bloat was decreased with protein supplementation, and further decreased with the addition of prairie hay. Protein and effective fiber supplementation improve the performance of cattle receiving a soybean hull diet.

Key Words: Soybean Hulls, Bloat, Effective Fiber

Introduction

Oklahoma cattle producers have recently used pelleted soybean hulls fed free choice as a low labor, cost effective growing program. Soybean hulls are high in digestible fiber, but have a small particle size and are relatively low in effective fiber (NRC, 1996). High levels of feed intake combined with a rapid rate of digestion could result in a significant bloat occurrence and/or incidence of acidosis. Additionally, protein content of soybean hulls is variable and may not be sufficient to maximize animal performance. Therefore, this experiment was designed to determine the effects of hay and(or) protein supplementation on growing steers receiving a pelleted SBH diet.

Materials and Methods

Seventy-eight crossbred steers initially weighing 420 lb were blocked by weight and allotted to three dietary treatments in a randomized complete block design. Five pen replicates per treatment were used with five steers per pen. Steers were housed in 15 x 30' dirt floor pens with feeding area and concrete apron covered. Dietary treatments were: 1) ad libitum access to soybean hulls (CON), 2) CON plus two lb/hd/d supplement (SUP), and 3) SUP plus 1.5 lb/hd/d long stem prairie hay (SUPHAY). Protein requirement was estimated assuming 2.5 lb daily weight gain (NRC, 1996). Chemical composition of dietary components are shown in Table 1. Protein supplement was formulated using a blend of soybean meal, cottonseed meal and wheat middlings, as shown in Table 2. Initially, SUPHAY fed cattle received 2 lb/hd/d. However, in order to get the cattle to consume all of the hay, this amount was gradually reduced to 1.5 lb/hd/d. Cattle were weighed every 28 d and feed intake and feed refusals were recorded daily. Visual bloat scores (Paisley et al., 1998) were recorded daily at approximately 2:30 p.m. Bloat scores were as follows:

0 = Normal, no visible sign of bloat.

1 = Slight distention of left side of animal.

2 = Marked distention of left side of animal. Rumen distended upward toward top of back. Animal has asymmetrical (egg-shape) look when walking away from observer.

3 = Severe distention. Distention is above top of back and visible from right side of animal (critical bloat). Animal is in obvious discomfort and may exhibit restricted respiration.

Due to high levels of feed intake and rumen fill, the score of 0 and 1 were never given. Consequently, the frequency of animals bloating to a score of 2 or 3 one or more times is reported.

Data were analyzed as a randomized complete block design using pen as the experimental unit. Treatment means were separated using a pair-wise T-test.

Results and Discussion

A significant occurrence of bloat began during wk 4, and continued through the remainder of the trial. Overall, weight gain and feed efficiency was excellent until the last 28-d period (Table 3). This dramatic reduction in performance late in the study is likely due to low rumen pH, resulting in acidosis and the onset of founder as seen in 8% of the animals. Because of the dramatic change in performance during the last period, cumulative data were analyzed through d 84, and through d 112.

Daily gain was increased by the addition of supplement and hay ($P<.01$). Feed intake was similar when supplement was fed, but increased ($P=.02$) when hay was fed. Total diet feed efficiency was improved ($P<.01$) with the addition of supplement, and was not affected by hay (Table 3). Over the entire study, average dry matter intake as a percentage of body weight was 2.4, 2.6, and 2.9 for the CON, SUP, and SUPHAY diets. Bloat frequency and severity were decreased ($P<.10$) with the addition of supplement, and further decreased ($P<.02$) by the addition of hay (Table 4). This remained constant throughout the feeding period. However, nearly 10% of hay fed cattle bloated one or more times, indicating that grater than 1.5 lb hay is necessary to alleviate digestive disturbances.

Implications

Even though soybean hulls contain a high concentration of NDF, small particle size, high levels of feed intake, and rapid digestion create a significant bloat and acidosis risk in the absence of adequate effective fiber. Protein supplement and hay reduces this risk and improves animal performance and diet utilization.

Literature Cited

NRC. 1996. Nutrient Requirements of Beef Cattle (7th Ed.). National Academy Press, Washington, DC.

Paisley, S.I. et al. 1998. Okla. Agr. Exp. Sta. Res. Rep. P-141:146.

Acknowledgments

Appreciation is expressed to Roy Ball and personnel at the Willard Sparks Center, Roche Animal Health for their financial support, and Hughes Cattle Company for supplying the steers.

Table 1. Chemical composition of dietary components[a].

Nutrients	SBH	Hay	Supplement
Nem, mcal/cwt	60.0	48.0	70.2
Neg,, mcal/cwt	34.0	23.0	45.5
Crude Protein, %	11.6	6.3	32.0
ADF, %	44.1	38.0	37.6
NDF, %	69.8	86.6	39.2
Ca, %	.6	.3	1.2
Phos, %	.1	.2	1.0
Dry matter, %	88.4	91.9	89.2

Table 2. Ingredient composition of protein supplement.

Ingredient, %	Dry matter	As fed
Cottonseed meal, 41%	30.7	30.3
Soybean meal, 47%	30.1	30.0
Wheat middlings	28.7	30.0
Cane molasses	4.2	5.0
Salt	2.7	2.5
Limestone, 38%	2.2	2.0
Dicalium phosphate	1.1	1.0
Selenium 600, ppm	.1	.1
Vitamin A-30,000, IU	.1	.1

[a]Dry matter basis.