Performance of Beef Heifers Fed Ad Libitum Soybean Hulls and Hay with or without a Monensin-Containing Mineral Supplement

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Story in Brief

This study was designed to determine the effects of an ionophore-containing mineral supplement on performance of growing beef heifers when fed a soybean hull pellet diet. Ninety-four 8-to 12-mo old crossbred heifers were used. The cattle were housed in dry lot pens with free choice access to soybean hull pellets and prairie hay in separate self-feeders. Treatments were free-choice salt or a commercial monensin-containing mineral supplement. Feed, hay, and supplement intake were monitored on a weekly basis. Weight gain and feed efficiency were both improved by 6% when heifers were provided the commercial monensin-containing mineral supplement compared with cattle receiving salt as the only mineral supplement. This response could be due to the effects of monensin, the added vitamins and minerals provided by the commercial mineral product, or both. Intake of effective NDF did not differ among treatments and was below that recommended by NRC (1996) to minimize the risk of digestive disorders and maximize microbial efficiency. Ruminal fluid pH was low (< 5.8) and did not differ among treatments. Incidence of bloat was reduced from 19% in salt-fed heifers to 6% in heifers fed mineral. Free-choice access to a monensin-containing mineral supplement improved animal performance and reduced the incidence of bloat in growing heifers that were self-fed soybean hulls and hay.

Key Words: Soybean Hulls, Mineral, Monensin, Beef Heifers

Introduction

Subacute acidosis, bloat, and founder have been identified as potential risks associated with feeding soybean hull pellets free choice to growing cattle (Shriver et al., 2000). Digestive disorders with this type of diet are thought to be associated with small particle size, high feed intake and a rapid rate of digestion. Even though soybean hulls have a high concentration of digestible fiber, they are relatively low in effective fiber (NRC, 1996). In previous work, we found that the incidence of bloat was significantly reduced and weight gain was increased when cattle receiving free choice soybean hulls were fed 1.5 lb per day of long stem prairie hay (Shriver et al., 2000). From this work, we concluded that supplemental effective fiber was necessary, and that 1.5 lb per day of hay was not adequate to alleviate the risk of bloat. Variation in dry matter intake of feedlot cattle has been associated with subacute acidosis and monensin has been reported to reduce the variation in dry matter intake (Cooper and Klopfenstein, 1996). Our objective was to determine the effects of providing a monensin-containing mineral supplement to cattle self-fed soybean hulls and prairie hay.

Materials and Methods

This study was conducted using 94 Angus and Angus x Hereford heifers (520±29 lb) in four replications (Table 1). Heifers ranged from 8 to 12 mo of age at the initiation of the feeding

periods. In each replication, cattle were housed in dry lot pens with free choice access to soybean hull pellets and prairie hay in separate self-feeders (Figure 1). Treatments included salt, provided in a covered self-feeder (SALT) or a commercial monensin-containing mineral supplement, also provided in a covered self-feeder (MINERAL; Fig 2.). The commercial mineral supplement (Sweetlix 9:6 R-1620, PM Ag Products) contained 9% calcium, 6% phosphorus, 24% salt, 1% potassium, 50 ppm iodine, 26 ppm selenium, 100,000 IU per lb vitamin A, 25,000 IU per lb vitamin D-3, 25 IU per lb vitamin E and 1620 grams per ton monensin.

Table 1. Replication initiation dates, duration and initial weight of heifers

Initiation date	Study duration, days	Initial weight, lb
10/27/98	84	403
6/17/99	85	525
3/1/00	85	527
7/17/00	86	622

Feed, hay, and supplement were weighed before being placed in the feeders and refusals were weighed back at 7-d intervals to determine intake of each component. Hay feeders were constructed to minimize hay waste, and very little hay waste was noted. Average chemical composition of soybean hulls and prairie hay is shown in Table 2.

Table 2. Average chemical composition of soybean hulls and prairie hay, % of DM

Item	Soybean Hulls	Prairie Hay
Crude Protein	11.4	6.1
Acid Detergent Fiber	42.6	41.0
Neutral Detergent Fiber	72.4	78.7

Heifers were dewormed prior to the beginning of each replication with Ivomec Eprinex®. The heifers were not implanted. Initial and final weights were taken after a 16-h overnight dry lot shrink, with no access to feed or water. During two of the replications, ruminal fluid pH was measured using ruminal fluid collected by rumenocentesis. A subset of five heifers from each treatment was sampled during early afternoon, because bloat had been observed primarily in mid-afternoon during a previous experiment (Shriver et al., 2000). The heifers were monitored daily for bloat and any other signs of digestive disorders. The bloat scoring system ranged from one to four with one being no sign of rumen distention, and four being extreme distention requiring intervention or treatment (Shriver et al., 2000). The study was analyzed as a completely random design with replication serving as the experimental unit.

Figure 1. Self-feeders used to provide soybean hull pellets and hay used in this experiment.

Figure 2. Self-feeders used to provide salt or the commercial mineral supplement.

Results and Discussion

Initial weight, animal performance and feed intake data are shown in Table 3. Average protein concentration of soybean hull pellets was low compared to the value given by NRC (1996) (12.2% DM). Marginal dietary protein and extreme weather conditions during three of the four replications likely contributed to relatively poor feed conversion. Protein supplementation has been shown to increase daily weight gain and feed efficiency when cattle consume soybean hull based diets (Shriver et al., 2000). Mineral consumption averaged 2.8 oz per head per day, resulting in average monensin consumption of 142 mg per head per day. Weight gain and feed efficiency were both improved by 6% when heifers were provided the commercial monensin-

containing mineral supplement compared with cattle receiving salt as the only mineral supplement. This response could be due to the effects of monensin, the added vitamins and minerals provided by the commercial mineral product, or both.

Consumption of soybean hull pellets, hay or mineral supplement did not differ among treatments. Total dry matter intake was consistently high for the 85 d periods, averaging 3.2% of body weight. Consumption of hay was low and very consistent with average intake across replications ranging from 1.8 to 2.2 lb per day.

Table 3. Performance of heifers receiving free choice soybean hull pellets (SBHP) and prairie hay with or without an ionophore containing mineral supplement

Item	SALT	MINERAL[a]	SEM	P
Initial weight, lb	518	522	2.5	.36
ADG, lb/d	2.33	2.47	.03	.03
SBHP intake, lb DM/d	17.8	17.5	.3	.55
Hay intake, lb DM/d	2.05	2.13	.09	.63
Feed:Gain, DM basis[b]	8.52	8.01	.11	.04
Salt/Mineral intake, oz/d	2.49	2.80	.25	.44
Monensin intake, mg/d	0	142	8.0	.001

[a]The commercial mineral supplement contained 1,620 g per ton of monensin.

[b]Feed:Gain includes soybean hulls and hay.

Effective NDF is the percentage of the NDF effective in stimulating chewing and salivation, rumination, and rumen motility (NRC, 1996). The 1996 Beef NRC recommends 20% effective NDF (DM basis) when cattle are fed mixed diets with variable bunk management and (or) no ionophore. In this study, intake of effective NDF did not differ among treatments and ranged from 7.5 to 10.2% of DM intake. High levels of feed intake and low effective fiber is likely responsible for the low ruminal fluid pH observed (Table 4). Although the monensin-containing mineral supplement did not significantly alter ruminal pH, only 6% of mineral-fed heifers were observed with a bloat score of 2 or greater compared with 19% of the salt-fed heifers (Table 4).

Table 4. Incidence of bloat and rumen fluid pH for heifers receiving free choice soybean hull pellets and hay with or without a monensin-containing mineral supplement

	SALT	MINERAL[a]	SE
% heifers with bloat score 2	12	6	-
% heifers with bloat score 3 or 4	7	0	-
Ruminal fluid pH	5.66	5.77	.11

[a]The commercial mineral supplement contained 1,620 g per ton of monensin.

Implications

Self-fed soybean hulls can be used as an effective, low labor nutritional program for growing beef cattle. However, intake of adequate effective fiber is necessary to minimize the risk of bloat and acidosis. A commercial monensin-containing mineral supplement improved animal performance and reduced the incidence of bloat in this experiment.

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