EFFECT OF CORN GLUTEN FEED OR SOYBEAN MEAL SUPPLEMENTATION ON INTAKE AND UTILIZATION OF PRAIRIE HAY BY HEIFERS.

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Story in Brief

Fifteen crossbred heifers [(700 pounds)] were used in three simultaneous replications of 5 x 5 Latin squares to determine the effect of supplementation with soybean meal, corn gluten feed, or blends of soybean meal and corn gluten feed on the intake and digestibility of medium quality prairie hay. Prairie hay was cut during the first half of July from a meadow harvested annually. Prairie hay was fed free choice. Treatments were: 1) Control, hay only, plus minerals-vitamins; 2) soybean meal based supplement (1.40 lb of 49.0% crude protein per day); 3) blend of 2/3 of the crude protein from soybean meal - 1/3 from corn gluten feed (1.93 lb of 39.3% crude protein) (1/3 corn gluten feed); 4) blend of 1/3 of the crude protein from soybean meal - 2/3 from corn gluten feed (2.5 lb of 28.9% crude protein) (2/3 corn gluten feed); 5) corn gluten feed based supplement (3.1 lb of 23.0% crude protein). Each supplement was fed to provide .67 lb or 300 grams of supplemental crud protein per day. Daily hay intakes were 12.9, 19.0, 18.0, 17.1 and ±5.4 lb on the Control, soybean meal, 1/3 corn gluten feed, 2/3 corn gluten feen and corn gluten feed treatments, respectively. Digestibilities of ration dry matter were 43.7, 49.7, 47.3, 47.7 and 42.7%, and daily digestible dry matter intakes were 5.8, 10.3, 9.7, 9.8 and 8.0 lb on these same treatments, respectively.

(Key Words: Prairie Hay, Corn Gluten Feed, Soybean Meal, Protein.)

Introduction

Corn gluten feed (CGF) is a by-product of the wet-milling of corn to produce corn starch syrup. It is the combination of corn bran and condensed steepwater solubles. CGF has become widely available over the last five years; its use has increased greatly. Some studies have been conducted with CGF, but very limited work has been done investigating its use in range supplements for beef cattle. Even less work has been conducted to determine the effects of CGF or various blends of CGF on intake and digestibility of medium quality range forage, similar to that consumed by grazing cattle during summer months. Therefore, this study was conducted to determine the effect of CGF vs soybean meal (SBM) and blends of CGF and SBM on the intake and utilization of medium quality prairie hay.

Materials and Methods

Fifteen crossbred heifers were randomly allocated to metabolism stalls using 5 x 5 Latin squares with three simultaneous replications. The treatments were: ad libitum prairie hay, plus: 1) minerals and

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vitamin A (control); 2) SBM based supplement; 3) a blend with one-third of the supplemental crude protein from CGF and two-thirds from SBM (1/3 CGF); 4) a blend with two-thirds of the protein supplied by CGF and one-third from SBM (2/3 CGF); and 5) CGF to supply all supplemental protein. The mineral and vitamin mixture was fed at a level of 50 g/day, and supplements were fed once daily to provide equal total daily supplemental protein intakes (.67 lb or 300 grams supplemental protein). The supplements (Table 1) were fed at the rate of 1.40, 1.93, 2.5 and 3.1 lb per day on the SBM, 1/3 CGF, 2/3 CGF and CGF treatments, respectively.

Each period in the latin square was 14 days with days 1-8 being used for adaptation. Prairie hay, fed and rejected, was weighed daily. Fecal samples were collected twice daily in each collection period. Lignin was used as a marker to predict fecal output for measurement of digestibilities. The rumen was sampled on day 14 within 2 to 4 hours after supplement was fed.

Prairie hay (fed and rejected), supplements and feces were weighed and sampled for moisture and chemical determinations. All samples were analyzed for crude protein, acid detergent fiber, neutral detergent fiber, cellulose, lignin and ash, although not all are to be reported herein. The pH of the rumen fluid was determined immediately after sampling, and the ruminal liquor was acidified and frozen for ammonia determination.

Results and Discussion

Supplementation significantly ($P<.01$) increased the intake of prairie hay compared with the control (Table 2). Hay intake was increased from 12.9 lb on the control treatment to 19.0, 18.0, 17.1 and 15.4 lb per day on the SBM, 1/3 CGF, 2/3 CGF and CGF treatments, respectively. The increase noted in hay intake on the SBM treatment was 47.2% which is in agreement with previous work in our laboratory by Guthrie et al. (1984). Hay intake decreased in a linear manner ($P<.01$) with decreasing level of SBM and increasing level of CGF in comparing SBM with different blends of CGF or CGF. Digestibility of ration dry matter was also improved ($P<.01$) by supplementation. Digestible dry matter intakes were 5.8, 10.3, 9.7, 9.6 and 8.0 lb per day for control, SBM, 1/3 CGF, 2/3 CGF and CGF treatments, respectively, giving almost a

Table 1. Ingredient composition (%) of the supplements (DM basis).

Ingredients	Control	SBM	1/3 CGF	2/3 CGF	CGF
SBM	---	92.34	44.13	17.19	---
CGF	---	---	50.40	78.54	96.51
Dicalcium phosphate	42.2	3.22	2.31	1.80	1.48
KCl	18.1	1.38	.99	.77	.63
TM salt	27.4	2.11	1.5	1.18	.96
Na_2SO_4	11.8	0.91	.64	.50	.41
Vitamin A, %	0.5	0.04	.03	.02	.01

Table 2. Intake of prairie hay, digestibility, ruminal NH_3 and pH as influenced by SBM and corn gluten feed supplementation.

Item	Treatment					
	Control	SBM	1/3 CGF	2/3 CGF	CGF	SE
Hay intake, lb[abc]	12.9	19.0	18.0	17.1	15.4	0.44
Supplement intake, lb[a]	0.0	1.4	1.9	2.5	3.1	0.02
Dry matter intake, lb[bc]	13.1	20.7	20.2	19.9	18.8	0.44
Dry matter dig, %[bc]	43.7	49.7	47.3	47.7	42.7	1.05
Digestible dry matter intake, lb [bc]	5.8	10.3	9.7	9.6	8.0	0.28
Apparent CP dig, %[bc]	17.9	46.2	40.2	38.6	31.9	1.88
Rumen pH	6.82	6.81	6.93	6.79	6.72	0.06
Ruminal (NH_3-N), mg/100 ml[bd]	0.61	2.30	2.55	3.42	3.62	0.25

[a]Dry matter basis.
[b]Significantly increased (P<.01) by supplementation.
[c]Significant linear (P<.01) decline with decreasing levels of SBM and increasing CGF.
[d]Significant linear (P<.01) increase.

two-fold increase in digestible DM intake on the SBM treatment. As with forage intake, a negative linear response (P<.01) was noted in ration dry matter digestibility with decreasing level of SBM and increasing CGF. Supplementation improved crude protein digestibility, but as with forage intake and digestibility, a negative linear (P<.01) decline in apparent crude protein digestibility occurred with decreasing levels of SBM and increasing CGF. Corrections for metabolic fecal nitrogen would yield higher actual protein digestion coefficients, but relative treatment differences would be similar to those noted herein. Observed dry matter digestibility values were higher than calculated or expected values on the SBM treatment (49.7% observed vs 46.2% expected or calculated), showing the positive effect of supplemental SBM on digestibility of prairie hay. This is in agreement with Guthrie et al. (1984). Calculated or expected digestibility values were based upon digestibility of the hay as observed on the control treatment and using an assumed digestibility of 80% for the supplement. However, for the CGF treatments, observed values were very similar to expected values.

Ruminal NH_3 nitrogen concentrations were increased considerably (P<.01) by supplementation. The linear increase (P<.01) noted in ruminal NH_3 concentrations (0.61, 2.30, 2.55, 3.42 and 3.62) on the control, SBM, 1/3 CGF, 2/3 CGF and CGF treatments, respectively, with increasing CGF may be related to the source of protein since CGF protein contains more non-protein nitrogen than SBM. No significant differences were noted in the pH of the rumen fluid among any of the treatments, averaging approximately 6.8 on all treatments.

In general, feeding of either SBM or blends of SBM and CGF improved both intake and digestibility of medium quality prairie hay, whereas supplementation with CGF produced some, although less, improvement in forage intake, with no improvement in digestibility.

Literature Cited

Guthrie, M.J., et al. 1984. Effect of Level of Protein Supplement on Intake and Utilization of Medium Quality Prairie Hay by Heifers. Okla. Agri. MP 116:156.