EFFECTS OF NONPROTEIN NITROGEN SOURCE IN BLOCKS ON INTAKE AND DIGESTION OF PRAIRIE HAY BY STEERS

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Summary

This intake and digestion study evaluated source of nonprotein nitrogen in cooked molasses blocks supplemented to 18 steers (590 lb) with ad libitum access to prairie hay, Treatments were 1) control (no block), 2) a block containing 60% crude protein with 83% from urea (UREA block), and 3) a block containing 60% crude protein with 42% from urea and 42% from biuret (UREA/BIURET block). Blocks were broken into small pieces to facilitate rapid consumption and fed once daily at .125% of body weight. Forage intake increased by 22%, total intakes (forage plus block) increased by 28%, and digestible organic matter intakes increased by 52% when either UREA or UREA/BIURET blocks were fed. Total diet digestibilities also increased with block supplementation. Intakes and digestibilities were similar for the UREA and UREA/BIURET blocks. Supplementing prairie hay with cooked molasses blocks containing high levels of nonprotein nitrogen increased intake and digestion, but replacing half of the urea with biuret had little effect.

(Key Words: Steers, Forages, Urea, Biuret.)

Introduction

Dormant range forages are often low in important nutrients, particularly protein. Providing supplemental crude protein, such as nonprotein nitrogen (NPN) or rumen-degradable protein, to cattle consuming these low-quality forages improves animal performance and forage utilization. Urea, the most common supplemental NPN source, releases its nitrogen rather rapidly in the rumen and thus is not well synchronized with the slower release of fermentable energy from forages. A more slowly released NPN source, such as biuret (a compound formed by thermal treatment of urea), might improve ruminal fermentation and forage utilization. Our objective was to evaluate the effects of NPN source (urea or biuret) in cooked molasses blocks on intake and digestion of low-quality forage by steers.

Experimental Procedures

Eighteen steers (590 lb initial body weight) were used in a complete block design. Steers were housed in individual pens with drinking water available at all times. Each steer received 20 grams of plain salt daily and had ad libitum access to coarsely chopped prairie hay; offered at 120% of the average intake for the previous 5 days. Treatments were 1) control (no supplementation), 2) a cooked molasses block containing 60% crude protein with 83% from urea (UREA block), and 3) a cooked molasses block containing 60% crude protein with 42% from urea and 42% from biuret (UREA/BIURET block). The cooked molasses blocks were broken into small pieces and fed daily at 0.74 lb as is (.125% of initial body weight). The experiment lasted 21 days; 15 days for adaptation and 6 days for the collection of orts (feed refusals) and feces (fecal collection bags).

Results and Discussion

The prairie hay contained (dry basis) 5.5% crude protein and 69.5% neutral detergent fiber (NDF). Crude protein in the UREA and UREA/BIURET blocks averaged 61.6% (dry basis), which was close to the expected values (60% as fed).

Intakes of forage organic matter, NDF, and crude protein increased (P<.08) by 22%, and total intakes (forage plus cooked molasses blocks) of organic matter and NDF increased (P#.05) by 28% and 23%, respectively, when either UREA or UREA/BIURET blocks were fed (Table 1). Total crude protein intakes nearly doubled (P<.01) when blocks were provided. Digestible intakes of organic matter increased by 52% (P<.01) and those of NDF by 47% (P<.01) when blocks were fed. Increased digestible organic matter intake, an indication of the available energy intake, was due partly to increased dry matter intakes and partly to an 18% improvement (P<.01) in organic matter digestibility when steers received blocks (Table 1). The improvement in organic matter digestion appeared to be due to greater (P<.01) NDF digestibilities.

Steers receiving UREA blocks had greater digestible crude protein intakes than steers receiving the UREA/BIURET block, but this difference has limited biological significance. Organic matter and NDF intakes and digestibilities were not significantly different between blocks. Although steers receiving the UREA block tended to have greater intakes and digestibilities, these differences were small and not statistically significant (P$.12).

Providing cooked molasses blocks containing 60% crude protein and high levels of NPN increased intake and digestion of prairie hay fed, but replacing half of the urea in the blocks with biuret affected neither intake nor digestion.

Table 1. Effects of Supplementation on Intake and Digestion by Steers

	Treatment[a]			
Item	Control	Urea	Urea/Biuret	SEM
Forage intake, lb/day				
Organic matter	9.6	11.8	11.6	.82
Neutral detergent fiber	7.2	8.9	8.8	.61
Crude protein	.58	.71	.70	.051
Total intake, lb/day				
Organic matter[b]	9.6	12.4	12.2	.82
Neutral detergent fiber	7.2	8.9	8.8	.61
Crude protein[b]	.58	1.15	1.12	.051
Digestible intake, lb/day				
Organic matter[b]	5.0	7.7	7.4	.44
Neutral detergent fiber[b]	3.5	5.3	5.1	.31
Crude protein[bc]	.20	.63	.57	.021
Digestion, %				
Organic matter[b]	52	63	61	1.5
Neutral detergent fiber[b]	49	60	58	1.9
Crude protein[b]	34	55	51	1.8

[a]Urea = cooked molasses block containing 60% crude protein with 83% from urea; Urea/Biuret = cooked molasses block containing 60% crude protein with 42% from urea and 42% from biuret.
[b]Average of blocks different than control (P<.05).
[c]Urea block different than Urea/Biuret block (P<.05).