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EFFECTS OF BASE INGREDIENT IN COOKED MOLASSES BLOCKS ON INTAKE AND DIGESTION OF PRAIRIE HAY BY BEEF STEERS

R. H. Greenwood, E. C. Titgemeyer, and J. S. Drouillard

Summary

Blocks based on cooked beet molasses, cane molasses, or concentrated separator by-product, (CSB) were tested to compare their effects on intake and digestion of prairie hay by beef steers. All blocks contained at least 30% crude protein. Steers fed the cooked molasses blocks consumed 22% more forage than control steers, but forage intakes were not different among the three different blocks. Intakes of digestible organic matter and neutral detergent fiber, indicators of energy available to the steers, were increased 38 and 29% respectively, by block supplementation but were not different among the three blocks. However, total tract organic matter and neutral detergent fiber digestibilities, expressed as a percent of intake, were slightly higher for steers fed the beet molasses block than those fed the cane molasses block or the CSB block. In summary, supplementation with cooked molasses blocks that contained adequate degradable protein increased forage intake and digestion. Generally, blocks made from the different by-products elicited similar responses, though steers fed the beet molasses product tended to have greater digestibilities than those fed blocks made from cane molasses or concentrated separator by-product.

(Key Words: Steers, Forage, Intake, Digestibility, Cooked Molasses Blocks.)

Introduction

Deficiencies of degradable intake protein can reduce digestion of dormant forage, which, in turn,

can limit forage intake and reduce the energy available to grazing cattle. To increase forage intake and digestion and, thus, energy available to cattle, supplements containing ruminally degradable protein are often fed. Previously, we demonstrated that cooked molasses blocks (based on beet molasses) containing 30% crude protein (12% from nonprotein nitrogen) increased forage intake and digestion.

Various molasses products including beet molasses, cane molasses, and concentrated separator by-product (CSB, desugared beet molasses) are available for use as base ingredients in cooked molasses blocks. Composition of cooked molasses blocks may vary with availability and(or) cost of base ingredients. Alterations in base ingredients will affect the source and quantity of carbohydrates, protein, and minerals added to blocks. Our objective was to evaluate effects of blocks with similar nutrient composition but different ingredient composition on intake and digestion of prairie hay by beef steers.

Experimental Procedures

Twelve steers (730 lb) were used in three simultaneous 4×3 incomplete Latin squares. The cooked molasses blocks were formulated to be not less than 30% crude protein, of which not more than 12% equivalent crude protein was provided by nonprotein nitrogen (urea). Predominant ingredients were beet molasses, cane molasses, or CSB; animal fat; plant and animal proteins; and processed grain by-products. The cooked molasses blocks were fed daily at a level of .92 lb (as-is basis) which provided .28 lb crude protein. Control steers did not receive molasses blocks. Steers were provided 20 grams of salt daily and ad libitum access to

water and prairie hay. Hay contained 5.9% crude protein and 69.4% neutral detergent fiber (NDF) (dry matter basis). Experimental periods were 18 days with a 12-day adaptation period followed by 6-day intake and total fecal collection period. Orts and fecal samples were collected daily in the morning in order to calculate forage intake and digestion. On day 12, ruminal fluid was collected at feeding and 2, 4, 6, 8, 10, and 12 hours post-feeding for analysis of ammonia and volatile fatty acids (VFA).

Results and Discussion

Forage intakes, digestible organic matter intakes, and total tract organic matter digestibilities (% of intake) were greater ($P<.05$) for steers fed any of the three cooked molasses blocks than for control steers (Table 1). The increase in digestible organic matter intake, an indicator of energy available to the steers, was likely a response to increased degradable intake protein provided by the cooked molasses blocks. Forage intakes and digestible organic matter intakes were not different among steers fed the three different blocks. Total tract organic matter and NDF digestions (percent of intake) were slightly higher for steers fed the beet molasses block than for steers fed the cane molasses or CSB block. The lack of difference in digestible organic matter intakes and the relatively

differences in digestibilities among the steers fed the three different blocks indicates that the blocks containing different base ingredients had similar attributes.

Ruminal ammonia concentrations increased ($P<.05$) when steers were fed any of the three blocks (average of .89 vs .21 mM for control steers), reflecting the additional degradable protein that the cooked molasses blocks supplied. Total ruminal fluid VFA concentrations were greater ($P<.05$) for steers fed the beet molasses or CSB block than for control steers, whereas those for steers fed the cane molasses block were intermediate. The elevation in total ruminal fluid VFA among steers fed the cooked molasses blocks was primarily a function of the increase in forage fermentation, which was shown by the increase in digestible organic matter and NDF intakes. However, some VFA could be attributed to sugar in the blocks.

In conclusion, supplementation with cooked molasses blocks increased forage intake and digestion, ruminal ammonia, and total ruminal VFA. Digestible organic matter increased by an average of 38% when steers were fed the cooked molasses blocks, probably because they supplied additional ruminally degradable protein, which allowed for increased forage digestion. Generally, the blocks based on beet molasses, cane molasses, and CSB elicited similar responses, although steers fed the beet molasses block tended to have greater digestibilities.

Table 1. Effects of Different Base Ingredients in Cooked Molasses Blocks on Intake and Digestion of Prairie Hay by Steers and Ruminant Parameters

Item	Control	Base Ingredient			SEM
		Beet	Cane	CSB ¹	
Organic matter					
Forage intake, lb/day	10.7 ^a	13.2 ^b	12.8 ^b	13.3 ^b	.37
Digestible intake, lb/day	5.2 ^a	7.4 ^b	7.0 ^b	7.3 ^b	.18
Digestibility, % of intake	48.7 ^a	54.0 ^c	52.2 ^{bc}	52.1 ^b	.62
Neutral detergent fiber					
Forage intake, lb/day	8.1 ^a	9.9 ^b	9.6 ^b	10.0 ^b	.26
Digestible intake, lb/day	3.8 ^a	5.1 ^b	4.7 ^b	5.0 ^b	.13
Digestibility, % of intake	46.9 ^a	51.9 ^b	49.3 ^a	49.3 ^a	.84
Ruminal parameters					
Ammonia, mM	.21 ^b	.95 ^a	.84 ^a	.87 ^a	.08
Total VFA, mM	80.3 ^c	92.7 ^a	85.4 ^{bc}	88.1 ^{ab}	2.1

¹Concentrated separator by-product.

^{a, b, c}Means within rows without common superscript differ (P<.05).