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Abstract

Crossbred heifers (683 lb; n = 175; 30 pens) were used to evaluate alfalfa and cooked molasses block supplementation to prairie hay. Treatments were arranged in a 2x3 factorial with the factors being 0 or 5 lbs of alfalfa supplementation, and supplementation with no block or with low or high protein blocks (analyzed to contain 14.4 and 27.5% crude protein, respectively). Heifers had ad libitum access to prairie hay and salt. The experiment was 89 days, with heifers fed blocks for 84 days. During days 5 to 19, heifers had ad libitum access to blocks. Thereafter, access was restricted to 4 hours daily. No significant interactions occurred between alfalfa and blocks for intake or gain. Supplementation with alfalfa increased total forage intake by 49% (18.4 vs. 12.3 lb/day), and gains from -.39 lb/day to +.95 lb/day. Intake of the blocks was lower when alfalfa was supplemented (.76 vs. .98 lb/day). Heifers fed the high-protein block gained more weight (.46 lb/day) than those fed the lowprotein block (.25 lb/day) or no block (.12 lb/day). Heifers fed the high-protein block ate more forage (16.1 lb/day) than those fed the low-protein block (14.8 lb/day), with heifers fed no block (15.3 lb/day) being intermediate. Intake of block was greater for the high-protein (.93 lb/day) than for the low-protein block (.81 lb/day). Differences in forage intake accounted for much of the differences in performance among treatments.

Keywords

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PERFORMANCE OF GROWING HEIFERS FED PRAIRIE HAY AND SUPPLEMENTED WITH ALFALFA AND(OR) COOKED MOLASSES BLOCKS OF DIFFERENT PROTEIN CONCENTRATIONS

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Summary

Crossbred heifers (683 lb; n = 175; 30 pens) were used to evaluate alfalfa and cooked molasses block supplementation to prairie hay. Treatments were arranged in a 2×3 factorial with the factors being 0 or 5 lbs of alfalfa supplementation, and supplementation with no block or with low or high protein blocks (analyzed to contain 14.4 and 27.5% crude protein, respectively). Heifers had ad libitum access to prairie hay and salt. The experiment was 89 days, with heifers fed blocks for 84 days. During days 5 to 19, heifers had ad libitum access to blocks. Thereafter, access was restricted to 4 hours daily. No significant interactions occurred between alfalfa and blocks for intake or gain. Supplementation with alfalfa increased total forage intake by 49% (18.4 vs. 12.3 lb/day), and gains from –.39 lb/day to +.95 lb/day. Intake of the blocks was lower when alfalfa was supplemented (.76 vs. .98 lb/day). Heifers fed the high-protein block gained more weight (.46 lb/day) than those fed the low-protein block (.25 lb/day) or no block (.12 lb/day). Heifers fed the high-protein block ate more forage (16.1 lb/day) than those fed the low-protein block (14.8 lb/day), with heifers fed no block (15.3 lb/day) being intermediate. Intake of block was greater for the high-protein (.93 lb/day) than for the low-protein block (.81 lb/day). Differences in forage intake accounted for much of the differences in performance among treatments.

(Key Words: Heifers, Forage, Supplementation.)

Introduction

Performance of cattle grazing dormant range usually is limited by the supply of protein. This is a result of nutrients (primarily N) limiting ruminal fermentation of forage fiber, which in turn reduces feed intake and further depresses performance.

The use of cooked molasses blocks is a common feeding strategy in the cattle industry. Much of the response to these blocks can be attributed to the protein they contain stimulating ruminal fermentation. This project evaluated responses to cooked molasses blocks under conditions that mimicked unsupplemented range and range supplemented with alfalfa hay. We evaluated cooked molasses blocks containing two levels of protein to determine how much of the response is attributable to the protein supplied by the blocks.

Experimental Procedures

Performance Trial. One hundred seventy-five crossbred beef heifers averaging 683 lb were used in a randomized block design experiment where forage intake and growth rate were measured. A total of 30 pens was used, with each pen containing 5 or 6 heifers. The six treatments, which were randomly allotted within each of five replications, were arranged in a 2 × 3 factorial with the factors being the basal forage offered to the heifers and block supplementation. The forage fed was either 1) prairie hay fed ad libitum or 2) prairie hay ad libitum plus 5 lb (as fed) alfalfa daily. These treatments represent a poor-quality and an intermediate-quality forage diet for cattle. The block

supplementation treatments were 1) a negative control, 2) a low-protein (14.4% crude protein, dry basis) cooked molasses block, and 3) a high-protein (27.5% crude protein dry basis) cooked molasses block. Blocks (approximately 40 lb) were manufactured in 4 gallon tubs and were placed in the feedbunks, one per pen. All heifers had ad libitum access to white salt blocks and water.

The entire experiment lasted 89 days, with heifers being fed blocks for 84 days. Beginning on day 6, heifers were provided ad libitum access to the appropriate cooked molasses block. After 14 days of block consumption, we noticed that block intake was much greater than that typical of free ranging cattle. Therefore, for the remainder of the experiment, heifers were allowed access to the blocks for only 4 hours of each day.

Digestion Study. Digestibilities for complete diets were measured during days 80 to 83 by cleaning pens and subsequently collecting total fecal output by scraping pens daily for 3 days. Digestibilities were measured for three of the five replicates; one observation (alfalfa plus the high-protein block) was lost because heifers escaped from their pen.

Results and Discussion

The prairie hay contained 5.2% crude protein and 73% NDF on a dry basis. The alfalfa hay contained 18.6% crude protein and 60% NDF on a dry basis.

Performance Trial. Effects of treatments on intake and performance are shown in Table 1. No significant interactions occurred between forage and block supplementation for any of the intake or performance criteria. Supplementing heifers with 5 lb/day of alfalfa increased average daily gain, gain efficiency, and forage and total intakes. On average, forage intake was increased 49% (6.1 lb dry matter/day) when alfalfa was supplemented to the heifers. Part of this increase can be accounted for by the alfalfa itself (4.4 lb dry matter/day). The remainder (1.7 lb dry matter/day) came from prairie hay. Gains were increased from an average loss of .39 lb/day to a gain of .95 lb/day when alfalfa was supplemented. Gain efficiencies were increased accordingly.

Although the largest responses were to alfalfa, responses to block supplementation also were significant. Heifers fed the high-protein block gained weight faster than those fed the low-protein block; those fed the low-protein block did not gain significantly faster than those receiving no block. Efficiencies followed the same pattern.

Heifers fed the high-protein blocks ate more ($P<.05$) forage than those fed the low-protein blocks, with the control heifers being intermediate but not statistically different than either block treatment. These trends follow the expected pattern when low and high protein supplements are fed to cattle consuming poor-quality (low protein) forages. Although the statistics did not indicate an alfalfa by block interaction, effects of block supplementation on forage intakes were numerically greater when heifers were not supplemented with alfalfa. Because protein would be less limiting when alfalfa was supplemented, less response to protein level in the molasses blocks would be expected.

Digestion Study. A significant interaction between alfalfa and block was observed for DM digestion. For heifers not receiving alfalfa, supplementation with either block increased DM digestibility. However, when alfalfa was supplemented, blocks numerically decreased DM digestibility. Supplementation with alfalfa led to remarkable increases in DM digestibility. Digestible DM intake were increased markedly by alfalfa supplementation; both intake and digestion increased.

Digestibility for heifers fed the low-protein block was nearly as high as that for heifers fed the high-protein block. Thus, differences in forage intake may account for much of the performance difference between the two blocks.

Table 1. Effect of Supplemental Alfalfa and Cooked Molasses Blocks on Total Feed Intake and Performance of Heifers

	No Alfalfa			5 lb/Day Alfalfa			
Item	No Block	14.4% Block	27.5% Block	No Block	14.4% Block	27.5% Block	SEM
In weight, lb	683	683	685	682	682	684	9.8
Out weight, lb[1,2]	632	649	665	754	761	786	9.2
ADG[a], lb[1,2]	-.57	-.39	-.22	.81	.89	1.14	.073
Gain:feed[1,2]	-.047	-.030	-.016	.044	.048	.058	.0052
Forage intake[b], lb/d[1,3]	12.10	11.52	13.42	18.41	17.99	18.83	.44
Block intake, lb/d[c,1,3]	0	.90	1.05	0	.72	.80	.038
Total intake, lb/d[1,2]	12.10	12.42	14.47	18.41	18.71	19.63	.45

[a]ADG = average daily gain.
[b]For heifers fed alfalfa, roughly 4.4 lb/day of forage dry matter intake would be alfalfa, and the remainder would be prairie hay.
[c]Calculated as block intake from days 6 through 89 divided by 89.
[1]Effect of alfalfa (P<.05).
[2]Effect of block, 27.5%>14.4%=none (P<.05).
[3]Effect of block, 27.5%>14.4% (P<.05).

Table 2. Effect of Supplemental Alfalfa and Cooked Molasses Blocks on Total Diet Digestion by Heifers

	No Alfalfa			5 lb/Day Alfalfa			
Item	No Block	14.4% Block	27.5% Block	No Block	14.4% Block	27.5% Block	SEM
DM[a] intake, lb/day							
Forage[b,1]	13.01	13.81	14.61	20.94	21.28	20.80	.95
Block[1]	-	1.05	1.24	-	.67	.79	.06
Total[1]	13.01	14.85	15.85	20.94	21.94	21.59	.95
DM[a] digestion, %[1,2]	38.1[a]	42.5[b]	43.5[b]	51.7[c]	50.5[c]	48.6[c]	.91
DDM[a] intake, lb/d[1]	4.96	6.31	6.87	10.85	11.10	10.50	.50

[a]DM = dry matter. DDM = Digestible dry matter.
[b]For heifers fed alfalfa, roughly 4.4 lb/day of forage dry matter intake would be alfalfa, and the remainder would be prairie hay.
[1]Effect of alfalfa (P<.05).
[2]Alfalfa × block interaction (P<.05); means not bearing common superscript differ.