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B.J. Healy

Robert T. Brandt Jr.

S.M. Gramlich

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EFFECTS OF ALFALFA FORM AND LEVEL ON SUBACUTE ACIDOSIS

B. J. Healy, R. T. Brandt, Jr., and S. M. Gramlich

Summary

Eight ruminally cannulated crossbred steers (1225 lb) were used to investigate the effects of 5 vs 10% alfalfa hay or pellets on rumen characteristics during subacute acidosis. Alfalfa hay was obtained from one source, and alternate bales were either chopped (3- to 4-inch length) or ground and pelleted (3/8-inch pellet). Intake during the recovery period after feed challenges tended (P=.12) to be greater for diets containing 10% alfalfa. Duration of rumen pH below 5.5 was less for diets with chopped vs pelleted (P<.10) or 10 vs 5% (P<.05) alfalfa. Total volatile fatty acid (VFA) concentrations during the challenge phase and for the overall experimental period were increased (P<.05) when steers were fed 5 vs 10% alfalfa diets but were similar during the baseline and recovery periods. The higher pH and lower VFA concentration resulting from feeding 10% alfalfa diets suggest that steers fed a moderate amount of roughage can withstand greater fluctuations in intake without developing acidosis.

(Key Words: Alfalfa, Subacute Acidosis, Finishing Cattle.)

Introduction

Roughage is a necessary component of high-grain diets for finishing cattle because it helps protect against effects of intake variation on rumen and digestive function. Physical form (particle length) has been assumed to play an integral role. Roughage is generally limited to low levels in finishing diets to maximize energy concentration, but when weather and(or) mechanical breakdown threaten to alter feed intake, ration roughage levels often are increased. Based on feedlot performance and carcass traits, previous research (1993 KSU Cattleman's Day) suggested that average quality alfalfa (15% crude protein) provided similar ruminal bulk and(or) tactile stimulation when either chopped or pelleted (3/8 inch pellet size). Additionally, that study found increased feed intake and a lowered incidence and severity of liver abscesses in steers fed 10 vs 5% alfalfa. Our objective in this study was to determine the effects of alfalfa form and level on subacute acidosis, using an approach that attempts to model the effect of intake fluctuations on rumen function.

Experimental Procedures

The chopped hay and pellets were from the same source used in a previous study (1993 KSU Cattleman's Day). Alternate bales of alfalfa hay from a common lot then were either chopped (3- to 4-inch length) or ground and pelleted (3/8-inch pellet). Eight ruminally cannulated crossbred steers (1225 lb) were used in two concurrent 4 × 4 Latin squares. Treatments were arranged as a 2 × 2 factorial experiment. Main effects were alfalfa form (chopped or pelleted) and level (5 or 10% of ration DM, Table 1). Steers were fed diet dry matter at 2% of BW in two equal feedings (8 a.m. and 8 p.m.) for a 10-day adaptation period. On day 11, steers received their 8 a.m. feed, but the p.m. feeding was omitted. Steers were challenged on the mornings of day 12 and day 13 by offering diet dry matter at 1.5% of BW in the feed bunk followed by diet dry matter at 1% of BW via the ruminal cannula 1.5 h postfeeding. Any offered feed that was not consumed also was placed into the rumen through the cannula at that time. The challenge was followed by a 3-day (day 14-16) intake recovery period when feed was offered as in the adaptation phase. Ruminal samples were taken postfeeding at: 0, 3, 6, 9, and 12 h (day 10); 3, 6, 9, 12, 18, and 24 h (days 12 and 13); and 12 and 24 h after the a.m. feeding on days 14 to 16.

Results and Discussion

Intake during the recovery period tended (P=.12) to be greater for 10% than 5% alfalfa diets (Table 2), but alfalfa form did not affect intake. Rumen pH stayed below 5.5 longer when pelleted alfalfa (P<.10) and 5% alfalfa (P<.05) diets were fed. Similarly, mean pH for the entire experimental period was lower (P<.05) when pelleted and 5% alfalfa diets were fed. Average total volatile fatty acid (VFA) concentrations (Table 2) were similar between chopped and pelleted alfalfa but were increased (P<.05) when 5% alfalfa diets were fed. The changes in VFA from baseline to recovery are presented in Table 3. It is not surprising that VFA concentrations would be greater for a lower roughage diet, because at an equal intake, it provides more fermentable substrate. However, total VFA concentrations were similar during the baseline and recovery periods for both 5 and 10% alfalfa diets. An increase in total VFA was evident during the challenge phase, especially the second day of the challenge. We conclude that chopped alfalfa is more beneficial in moderating rumen pH during variable intake patterns than is pelleted alfalfa. Combined with earlier results, this study suggests that 10% inclusion of either form of alfalfa enhances and stabilizes feed intake compared to 5%.

Table 1. Diet Compositions [a]

	Chopped Alfalfa		Pelleted Alfalfa	
Ingredient	5%	10%	5%	10%
Dry rolled corn	84.96	81.10	85.62	81.28
Chopped alfalfa	5.00	10.00	----	----
Pelleted alfalfa	----	----	5.00	10.00
Supplement [b]	7.54	6.54	6.88	6.22
Molasses	2.50	2.50	2.50	2.50

[a]Dry matter basis.
[b]Supplements were formulated so that diets contained 12% crude protein, .7% Ca, .3% P, .7% K, 1550 IU Vit A, and 27 ppm monensin.

Table 2. Effect of Alfalfa Physical Form and Level on Intake and Ruminal Fermentation Characteristics

	Alfalfa Form		Alfalfa Level		
Item	Chopped	Pelleted	5%	10%	SEM
Intake, % of BW [a]	1.28	1.12	1.01	1.39	.16
Hours pH below 5.5 [bcd]	20.5	25.0	26.2	19.3	1.8
Mean pH [de]	5.28	5.14	5.14	5.28	.10
Total volatile fatty acids [d], mM	114.9	119.6	121.7	112.7	6.0

[a]During recovery (day 14 to 16). [b]During challenge days (day 12 and 13). [c]Alfalfa form effect (P<.10). [d]Alfalfa level effect (P<.05). [e]Alfalfa form effect (P<.05).

Table 3. Effect of Alfalfa Physical Form and Level on Total Volatile Fatty Acid Concentration over Time

	Alfalfa Form		Alfalfa Level	
Item, hr postfeeding	Chopped	Pelleted	5%	10%
Day 10, baseline	------------------- millimoles/liter	--------------------		
0	93.0	96.4	96.6	92.8
3	98.3	103.4	103.7	98.0
6	99.9	90.6	97.5	93.0
9	91.4	92.7	93.7	90.5
12	92.2	94.0	96.6	89.6
Day 12, 1st challenge				
3	135.8	148.7	151.3[a]	133.2[b]
6	136.0	137.1	145.7[a]	127.4[b]
9	118.4	122.4	128.3[c]	112.5[d]
12	118.8	123.4	125.5	116.7
18	108.1	119.7	116.3	111.5
24	95.9	106.3	108.2[c]	94.0[d]
Day 13, 2nd challenge				
3	179.0	180.0	186.6[c]	172.3[d]
6	178.9	177.9	199.4[a]	157.4[b]
9	141.1	149.4	157.5[a]	133.1[b]
12	132.9	143.8	147.1[a]	130.0[b]
18	126.2	128.5	133.5	121.2
24	123.2	126.2	128.1	121.3
Recovery, hr after a.m. day 14				
12	95.9	106.6	102.2	100.3
24	97.0	104.4	101.8	99.6
36	95.9	104.2	99.3	100.8
48	98.1	97.6	95.9	99.8
60	92.0	98.6	89.9	100.7
72	94.3	99.0	95.3	98.0

[a,b]Means in a row with unlike superscripts differ ($P<.05$).
[c,d]Means in a row with unlike superscripts differ ($P<.10$).