caused a change in the acid-base content of blood; and therefore in evaluating systemic acidosis. Positive values indicate an excess of base; negative values indicate an excess of acid or a deficit of base. The pre-feeding base excess values (Figure 4) of steers fed the control ration were lower than those of steers fed the "buffered" rations, and at 24 hours after feeding were decreased below the pre-feeding values. The base excess values of steers fed the "buffered" diets all decreased markedly during the first 4 hours after feeding, and remained low at 24 hours after feeding except for steers fed the rations containing 1% sodium bentonite and 1% dolomitic limestone or 1% $KHCO_3$. At 24 hours after feeding the base excess values of steers fed the rations containing sodium bentonite and dolomitic limestone or sodium bentonite and $KHCO_3$ had returned to values very similar to the pre-feeding values. This indicates that these dietary buffers were beneficial in enabling the steers to return to a normal acid-base status.

Literature Cited

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Rumensin Addition to Silage

F. N. Owens and E. C. Prigge

Story in Brief

Addition of low levels of rumensin to silage enhanced fermentation and lactic acid production, but higher levels allowed butyrate to accumulate. Addition of rumensin to silage at ensiling or feeding time increased digestibility slightly. Since a large proportion of rumensin survives silage fermentation, it is possible to administer rumensin to cattle by feeding rumensin treated silage.

Introduction

Rumensin[1] increases efficiency of feedlot cattle gain by 8 to 15% according to a large number of trials. It alters fermentation in the rumen, increasing the propionic acid level. This study was designed to ex-

[1] Elanco, Inc., Greenfield, Indiana.

amine (1) the influence of rumensin on silage fermentation and digestibility and (2) the stability of rumensin through fermentation.

Materials and Methods

Various materials (Table 1) were ensiled with rumensin in 1974 and 1975. Following at least 60 days of fermentation in 1 gallon sealed glass jars, samples were analyzed for fermentation acids, protein fractions, in vitro dry matter digestibility and stability against mold.

Results and Discussion

Results of the 1974 corn silage study will be presented in detail. The 1975 silages generally confirmed these results. Table 2 lists pH and acid levels with added rumensin. Levels above 44 parts per million of dry matter (or one-thirtieth of a pound of active ingredient per ton of 30% dry matter silage) increased pH and decreased lactic and acetic acid levels. The lower acid levels probably allowed butyrate to increase. In 1975 silages, lower rumensin levels (5 ppm) appeared to increase lactic acid by 10 to 50% above no addition and effects similar to 1974 of high levels depressing fermentation were observed.

Rumensin addition at higher levels appeared to increase the protein content of the silage (Table 3). In 1975 silages, increases in protein content averaged slightly less than 0.18% for every 10 ppm added rumen-

Table 1. Rumensin Treated Silages.

Year	Product	Dry matter (%)	Rumensin (ppm)
1974	Corn silage	40.1	0,10,33,44,110,220
1975	Alfalfa	32.5	0,10,50,100,200
1975	Bermuda grass	33.7	0,2,5,10,33,44
1975	Corn silage	23.3	0,2,5,11,33,44
1975	Forage sorghum	23.5	0,2,5,10,33,44

Table 2. Rumensin Corn Silage, 1974.

Rumensin, ppm	pH	Lactic	Acetic	Propionic	Butyric
			——mg/g dry matter——		
0	4.0^{1}	140^{1}	19.6^{1}	$.3^{1}$	$.5^{1}$
10	4.0^{1}	$135^{1,2}$	$19.1^{1,2}$	$.5^{1,2}$	$.7^{1}$
33	4.0^{1}	141^{1}	$19.1^{1,2}$	$.7^{1,2}$	$1.0^{1,2}$
44	4.2^{2}	130^{2}	16.2^{2}	1.5^{3}	$.7^{1}$
110	4.3^{2}	102^{3}	11.2^{3}	1.0^{2}	2.6^{3}
220	4.3^{2}	87^{4}	12.0^{3}	$.9^{2}$	1.2^{2}

^{1,2,3,4} Values in a column actually differ if they do not share a common superscript.

Table 3. Rumensin Corn Silage, 1974.

Rumensin, ppm	Total protein	Soluble N	Soluble protein
	(% of DM)	*(% of total)*	*(% of total)*
0	7.12	47.2	4.7
10	7.62	47.0	8.6
33	7.25	49.5	11.2
44	7.75	46.5	4.5
110	8.00	54.1	10.7
220	8.19	58.0	15.4

sin at levels up to 44 ppm. No explanation for this effect is apparent, but an interaction of protein level and monensin in the rumen has been suggested.

With butyrate fermentation at higher rumensin levels, more of the protein was soluble, possibly due to prolonged fermentation. All the above factors indicate that lactate fermentation in silage is stimulated by low levels of rumensin, but that high levels inhibit lactate and may increase butyrate formation and energy loss during fermentation.

Digestibility of silages was measured with various levels of silage and corn grain. It was increased slightly by adding rumensin to silage either at ensiling or at feeding time (Table 4), with the most marked stimulation when silage was diluted with corn grain to 15 or 30% of the dry matter. Elevated propionic acid levels (Table 5) were evident with rumensin addition at ensiling or at feeding time. As the fermentation acids were altered by adding the drug at either time, this suggests that rumensin would survive silage fermentation and benefit animal performance similarly whether it is added to a ration at feeding time or at ensiling to silage which is subsequently fed. Levels above 44 ppm, however, may result in less desirable fermentation with high dry matter silages. First appearances of mold on samples exposed to air was used as an index of stability of the fermented silage. Rumensin level had no affect on stability of the silage. A steer feeding trial is now underway with rumensin treated corn silage.

Table 4. Rumensin Corn Silage, 1974.

Silage	Silage level (%)			
	100 (10 ppm)	75 (44 ppm)	30 (110 ppm)	15 (220 ppm)
	48 hr. Dry matter digestion			
Control	55.9	63.4	73.1	76.1
Ensiled rumensin	57.3	63.3	75.5	78.9
Control and rumensin	56.9	66.7	78.8	78.8

Table 5. In Vitro VFA Pattern.

Silage	Silage level (%)			
	100 (10 ppm)	75 (44 ppm)	30 (110 ppm)	15 (220 ppm)
	In vitro propionate (% of total VFA's)			
Control	16.0	16.1	18.8	20.7
Ensiled rumensin	17.8	22.2	26.1	28.2
Control and rumensin	21.3	24.2	27.5	29.1

Urea and Feeding Frequency

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Story in Brief

The influence of frequency of feeding urea supplemented concentrate rations was examined using 20 finishing lambs in individual pens. Rations were approximately 80% concentrate with either 1% urea based ration or 3% urea present. The total rations were available free choice either 24 hours per day or in a 1 hour daily meal. Lambs fed the 3% urea diet for only 1 hour daily consumed 46% less feed and gained at less than 30% the rate of lambs fed either 1% urea or lambs with feed available 24 hours daily. Adding urea to the basal diet and feeding it for 24 hours each day, however, increasing intake by 23% and gains by 14% while depressing feed efficiency by 7%.

Introduction

There is an increased demand by livestock producers for an economical and efficient protein supplement for cows on winter range and for steers in the feedlot. Urea and other non-protein nitrogen compounds are usually cost-cutting alternatives. But under many feeding conditions, high urea supplements are fed in a single meal. More uniform intake of urea has been suggested to be beneficial. This study was designed to investigate the effect of frequency of feeding of a high urea ration on performance and supplement consumption of finishing lambs.