LIMESTONE AS A BUFFER IN FINISHING RATIONS

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SUMMARY

Feed grade limestone was evaluated as a buffer in high energy finishing rations for beef steers in a two-year study at the Carrington Irrigation Station Livestock Unit. Eighty (80) Hereford steers were allotted to one of the following ration treatments: control, 1% limestone, 2% limestone and 4% limestone added to a barley-corn silage ration. No significant differences ($P < .05$) were observed between treatments for feedlot performance or carcass traits. Steers receiving 1% to 2% limestone in their ration tended to gain faster with better feed efficiency. Steers receiving supplemental limestone tended to have more desirable carcasses than control steers with less fat and larger rib eyes. Results are not conclusive but indicate potential economic advantages for using limestone as a buffer in high energy finishing rations.

INTRODUCTION

Finishing cattle on high energy rations reduces overhead costs by shortening feeding time. Higher rates of gain are achieved with rations containing a large proportion of concentrates. These rations, however, increase incidence of acidosis, a digestive disturbance caused by a high starch diet. Reduced feed intake and lower gains result. Considerable research has been done on adding different buffering materials to the ration.

Limestone is an inexpensive source of calcium for ruminants and is also considered a buffering material. Research reports are not consistant on the effects of adding limestone to high energy ruminant rations (Wheeler, 1980). The variability in response may be attributed to (1) diet already contains adequate buffering capacity, as with alfalfa based diets; (2) low concentrate intake that does not stress the gastrointestinal tract environment and (3) differences among limestone sources and their buffering ability (Wheeler, *et al.* 1981a).

Variation in buffering ability is due primarily to particle size and source of feed grade limestone. Smaller particles have a faster reactivity rate and apparently greater buffering ability. Steers fed high concentrate diets containing fast-rate-of-reactivity limestone gained 0.64 pounds per day more and had 17% better feed efficiency than steers fed slow-rate-of-reactivity limestone (Wheeler *et al.* 1981a).

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Source of limestone also appears to be a critical factor with createcous favored over brecciated and both types superior to dolomitic (Wheeler *et al.* 1981b). Additional research suggests buffers are most effective during adaptation to high energy rations (Weinberg and Schaffner, 1976).

Feed grade limestone is generally available in mixed particle sizes. A practical evaluation of limestone as a buffer may be made by mixing limestone at varying proportions of the ration dry matter. Lambs fed 1% limestone in a high energy finishing ration gained 17% faster than controls (Dunn *et al.* 1977.) Steers fed 1.8% limestone in high grain diets produced carcasses with higher marbling scores, less fat thickness and more desirable yield grades than control steers (Russell *et al.* 1980.) In high corn silage rations, limestone added at ensiling (1% of dry matter) increased feed efficiency 9.1% over controls but daily gains were not affected (Byers, 1980).

To further evaluate levels of limestone in a high energy beef finishing ration, a two year study was conducted at the Carrington Irrigation Station Livestock Unit.

MATERIALS AND METHODS

A high barley ration was offered to 80 Hereford steeers randomly allotted to one of four treatments: control, 1% limestone, 2% limestone and 4% limestone on a dry matter basis. Limestone used in the ration was ground to pass through a 200 Um screen. A pelleted premix containing 12% limestone and 87.5% barley was added at varying levels to attain desired limestone intake. Rolled barley and corn silage made up the rest of the ration. Barley constituted 94% of the ration and corn silage 6% on a dry matter basis. Corn silage was approximately 30% dry matter.

Steers used in the trial had been wintered on a moderate energy ration and averaged 809 pounds at the start of the trial in May. Cattle were fed *ad libitum* once per day in fenceline bunks. No implant or other feed additives were used. Animals were slaughtered at approximately 1050 pounds. NDSU Animal Science personnel assisted in collecting carcass data and statistical analysis of the data.

RESULTS AND DISCUSSION

Least square means for feedlot performance and carcass data are presented in Tables 1 and 2. No statistical-

ly significant differences wre observed between treatments in this experiment ($P < .05$).

Average daily gains ranged from 2.11 pounds per day for control steers to 2.24 pounds per day for steers on 2% limestone. Feed efficiency defined as pounds of dry matter per pound of gain varied from a low of 9.83 for steers on 2% limestone to 10.64 for control steers.

Table 1. Feedlot Performance Of Steers Fed Limestone As A Buffer In Finishing Rations.

	Treatment			
	Control	1% Limestone	2% Limestone	4% Limestone
Number Head	19	19	17	18
Initial Wt. (lb)	810	810	809	807
Final Wt. (lb)	1037	1051	1053	1045
ADG. (lb)	2.11	2.17	2.24	2.13
Feed Efficiency (DM/Gain)	10.64	9.97	9.83	10.50

Table 2. Carcass Data For Steers Fed Limestone As A Buffer In Finishing Rations.

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Carcasses from steers on all supplemental limestone treatments tended to be more desirable than carcasses from control steers. Fat thickness ranged from .35 inches for 4% limestone to .41 inches for control. Rib eye area varied from 10.1 sq. in. for control to 10.78 in. for 4% limestone. Average yield grade was less desirable for control steers than those receiving supplemental limestone. Quality grade was highest for steers on 2% limestone with control steers exhibiting lowest quality carcasses. Dressing percent was quite uniform among treatments varying only 0.28%.

Seven steers were removed from the trial. During the first year an outbreak of polioencephalomalacia caused the removal of five steers.

The limited number of steers used in this trial makes statistical differences between treatments harder to detect. Results tend to favor using limestone as a buffer in high energy finishing rations. Other research has been more conclusive in favor of feeding limestone. At 1 to 2% of the ration, improved feedlot performance and more desirable carcasses may result. Higher levels of limestone depress appetites and reduce efficiency. Feeders using limestone as a buffer should evaluate particle size of the product. Grinding limestone to pass through a 50 Um screen has been demonstrated to dramatically increase the rate-of-reactivity. Feeding limestome may be of maor economic importance by increasing feedlot performance and producing more desirable carcasses.

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