Effect of Salt Levels on Growth Performance, Carcass Characteristics and Cost of Gain of Finishing Cattle

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SUMMARY

Two hundred and eighty-eight steers were used in a randomized experimental design to evaluate the effects of four levels of supplemental salt (0.0%, 0.125%, 0.25% or block salt) on cost of gain, growth performance and carcass characteristics. Salt level did not affect (P>0.05) ADG, feed intake, feed efficiency, feed cost of gain or carcass characteristics. Salt level did reduce dressing percent and hot carcass weight linearly (P<0.05).

Key Words: Salt, Feedlot Cattle, Growth Performance

INTRODUCTION

Many farmers use manure to fertilize farm ground and pastures because it is relatively cheap and replenishes nutrients and organic matter.

Salt, like nitrogen and phosphorus, is essential for plant growth; conversely excess, is also detrimental for plant survival. Accumulation of sodium in the soil can lead to decreased yields and crop failure (Shainberg, 1996).

Most cattle finishing rations contain at least 0.25% salt. To combat urinary calculi, nutritionists have recommended adding higher levels of dietary salt, with the rationalization that cattle would drink more water, amplifying urine output, thus decreasing the severity of urinary calculi (Bailey, 1967).

The objective of this study was to evaluate the effects of four levels of supplemental salt on growth performance of finishing cattle and resulting carcass characteristics.

MATERIALS AND METHODS

Four levels of supplemental salt (sodium chloride) were fed in a trial at the Eastern Colorado Research Center (ECRC), feedlot near Akron, Colorado starting November 29, 1999. A randomized experimental design was used to evaluate growth performance and carcass characteristics of 288 beef steers. Steers were randomized by breed, stratified by weight, and assigned to one of four treatment groups. The treatments consisted of (1) 0% (supplemental salt), (2) 0.125%, (3) 0.25% added supplemental salt or (4) a salt block added to the feed bunk (DM basis) and fed with the same diet as treatment 1; 0% supplemental salt. Each treatment group consisted of an average of 72 animals per treatment in six pens.

Steers were weaned prior to the start of the trial and consisted of several breed crosses including Angus, Hereford, Limousin, Red Angus, Simmental and Charloais from three different ranches in Colorado. A series of step-up rations were fed (Table 1). The supplement composition is shown in Table 2. The finishing ration was fed for 151 days until the termination of the trial, May 11, 2000.

All cattle were vaccinated with Ultrabac®7/Somubac®, de-wormed with 10 cc of Dectomax®, implanted with Revalor-S® and weighed, unshrunk, on November 29th and November 30th at the beginning of the trial. Weights were taken approximately the same time of day, in the morning, before being fed. During the trial, cattle were weighed, unshrunk, every 27-40 days (Table 3). All cattle were treated with 34 ml of Aspen® Ivermectin at day 38 because of the high incidence of lice. Cattle were re-implanted with Synovex-S® and revaccinated with Ultrabac® 7/Somubac® on day 66. Cattle were fed once daily in the morning allowing ad libitum access to the feed.

At the end of the trial, the steers were again weighed, unshrunk, on May 10th and May 11th 2000 and shipped to Excel® (Fort Morgan, Colorado) for processing. Hot carcass weight, yield and quality grade data were recorded. Orthogonal contrasts were used to analyze the mean data between the treatments. Performance and slaughter data were analyzed using the MIXED and LOGISTIC procedures of SAS® Version 8.0 (SAS, 2000).

RESULTS AND DISCUSSION

Feed intake tended to increase days 0-38 as dietary salt increased in the diet. Over the 163 day study, dietary salt level did not affect (P>0.05) feed intake, average daily gain or feed efficiency (Table 3). Feed cost of gain was not influenced by dietary salt level. Off test weight was not affected by dietary salt, although weight tended to decrease as dietary salt increased. Morbidity and mortality were not affected by dietary salt level (Table 4). Shrunk dressing percent was reduced linearly (P<0.05) as dietary salt increased. Hot carcass weight also decreased linearly (P<0.05) as the salt level increased in the diet resulting in almost a 20 lb decrease from the lowest to highest salt treatment (Table 5). Quality and yield grade were not affected by salt treatment.

A water sample, taken at the start of the trial, was analyzed for sodium content at 98 mg/L (Olsen's Agriculture Lab; McCook, NE). Sodium consumption therefore, was calculated from ECRC's water sodium level (98 mg/L) and using an estimated water intake of 8.5 gallons/head/day. The 8.5 gallons/head/day is an average, which is based on cattle's actual water consumption of 7 to 12 gallons per head per day (Texas A &M Extension, 2000).

The total estimated sodium consumed by each steer, from the water, was approximately 0.11 ounces per day or 0.28 ounces of sodium. Therefore, salt consumption from ECRC's water source, contributed 18-38% of the overall salt consumption, depending on treatment. Table 6 displays the estimated salt consumed on average per day per animal.

The NRC (1996) recommends feeding growing and finishing cattle 0.15 to 0.20% salt in their diets. The cattle on the 0% and the 0.125% treatments, in this particular study, had an adequate supply of salt from the diet and the water, meeting NRC recommendations. However, NRC recommendations for growing and finishing steers, was exceeded with the addition of 0.25% salt and the salt block treatments.

The cattle receiving the 0.25% supplemental salt treatment and the control supplement plus the salt block in the bunk, appeared to have approximately the same salt consumption.

The cattle on the block treatment consumed approximately ¾ of an ounce/head/day from the block, which was calculated by weighing the block, during each weigh period or adding a new salt block to the feed bunk when

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necessary and averaging salt consumption per head per day by rate of disappearance of the salt block (the calculation did not account for salt block disappearance rate due to weather). Therefore, total salt intake for cattle on the O% supplement plus the salt block treatment, was approximately equal to cattle fed the 0.25% supplemental salt treatment. Consequently, the NRC (1996) salt recommendations for finishing and growing cattle may be higher than necessary for current cattle diets.

IMPLICATIONS

A performance, carcass or cost advantage to supplementing finishing rations with salt at or above NRC (1996) recommended levels was not apparent in this trial. Hot carcass weight and dressing percent were reduced linearly ($P<0.05$) by increasing dietary salt. The value of manure from feedlots may be enhanced without reducing growth performance by reducing dietary salt levels in calf finishing diets and also decreasing the amount of salinity in manure. Cattle consumed approximately ¾ ounce of salt/head/day from salt blocks.

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Table 1. Ration Composition (%, Dry Matter) of Rations Fed to Beef Calves.

	Step-Up Rations		
Ingredient	**I.**	**II.**	**III.**
	Percent ingredient in ration		
Whole Corn	45.99	72.48	86.60
Triticale Grain, Dry Rolled	14.91	0.0	0.0
Supplement[a]	7.09	7.09	7.23
Millet Hay	32.06	20.43	6.16
Total	100	100	100
Days Fed	7	5	151

[a] See Table 2 for supplement composition.

Table 2. Supplement Composition (%, Dry Matter) for 0.0, 0.125, 0.25%And Block Salt Treatments Fed to Beef Calves

Ingredient,	0% & Block Salt	0.125%	0.25%
Salt	0	1.68	3.37
Sunflower Meal	31.77	33.48	35.20
Calcium Carbonate	15.54	15.50	15.46
Wheat Midds	26.33	22.87	19.41
Urea	13.80	17.80	13.80
Dehydrated Alfalfa Meal	5.00	5.00	5.00
Potassium	3.18	3.20	3.22
Ammounium Sulfate	1.95	1.95	1.95
Bio-Phos	1.43	1.51	1.59
Rumensin	0.21	0.21	0.21
Beef Trace Mineral Mix	0.21	0.22	0.22
Niacin 99%	0.14	0.14	0.14
Selenium (0.06)	0.13	0.13	0.13
Tylan 100	0.06	0.06	0.06
Vitamin E 125 IU/lb.	0.07	0.05	0.05
Manganese Sulfate	0.05	0.05	0.06
Ferrous Sulfate	0.06	0.06	0.06
Farr A and D 40/4	0.05	0.05	0.05
Vitamin E 20,000 IU/lb.	0.05	0.05	0.05
Copper Sulfate	0.03	0.03	0.03
% Nutrient Composition	**0.0 & Block**	**0.125**	**0.25**
Crude Protein	56.40	56.40	56.40
Fat	1.66	1.56	1.48
Calcium	6.66	6.66	6.60
Phosphorus	0.85	0.85	0.85
Potassium	2.82	2.82	2.82
Magnesium	0.48	0.47	0.47
Sodium	0.09	0.65	1.41

Table 3. Growth Performance of Beef Cattle Fed Different Salt Treatments

	Levels of Supplemental Salt, %				
Item	**0**	**0.125**	**0.25**	**Block Salt**	**SEM**
Number head (pens)	71(6)	74(6)	70(6)	73(6)	
Initial Weight, lbs.	670	670	668	673	45.00
Feed Intake, lbs.					
0-38	19.05	20.17	22.33	18.00	1.39
39-66	19.24	19.47	19.32	19.52	0.79
67-104	21.19	20.55	20.84	20.95	0.68
105-122	21.09	19.42	20.43	20.68	0.74
123-163	22.43	22.53	22.52	22.44	0.65
0-163	20.67	20.44	20.37	20.32	0.74
Average Daily Gain, lbs.					
0-38	4.15	4.24	4.33	4.17	0.14
39-66	3.56	3.60	3.65	3.42	0.21
67-104	4.01	3.55	3.50	3.88	0.15
105-122	2.36	2.16	2.59	2.77	0.25
123-163	3.63	3.61	3.63	3.46	0.18
0-163	3.70	3.61	3.68	3.67	0.09
Feed Efficiency, feed/gain					
0-38	4.59	4.76	4.26	4.31	0.31
39-66	5.57	5.49	5.47	5.87	0.53
67-104	5.30	5.82	5.99	5.42	0.23
105-122	9.71	9.71	8.07	7.64	0.95
123-163	6.31	6.30	6.42	6.56	0.41
0-163	5.60	5.68	5.78	5.56	0.23
Feed Cost per cwt of gain	$27.06	$26.84	$26.83	$26.42	1.77
Final Weight, lbs.	1274	1257	1268	1273	38.76

Table 4. Mortality and Morbidity for Beef Cattle fed Different Levels of Salt

	Levels of Supplemental Salt, %			
Item	**0.0%**	**0.125%**	**0.25%**	**Block Salt**
Mortality, %	1.41	0.0	1.43	0.0
Morbidity, %	11.27	8.11	8.57	6.85
Foot Rot	2.82	4.05	0.0	1.37
Respiratory	7.04	2.70	8.57	5.48
Bloat	0.0	0.0	0.0	0.0

Table 5. Carcass Characteristics for Beef Cattle fed Different Levels of Salt

	Level of Supplemental Salt, %				
Item	**0.0**	**0.125**	**0.25**	**Block**	**SEM**
Shrunk Dressing %, [a]	62.44	62.06	61.37	61.01	0.52
Hot Carcass Wt., lbs.[a]	771	758	754	752	5.26
% Choice or better	59.92	54.11	58.21	54.25	6.14
Yield Grade	2.4	2.3	2.4	2.5	0.08

[a] Linear affect (P<0.05).

Table 6. Average Dietary Salt Consumption of Beef Calves based on Ounces of Salt Consumed per Head per Day

Item	***Levels of Supplemental Salt, %***			
	0.00	**0.125**	**0.25**	**Block**
Salt consumed from diet	.43	.83	1.22	.43
Salt consumed from water*	.27	.27	.27	.27
Salt disappearance from Block	---	---	---	.76
Total	.70	1.1	1.49	1.46

*Salt consumed from water based on cattle drinking 8.5 gallons per day.