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Feeding Kelp Meal in Feedlot Diets

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Benefits of supplemental kelp meal for receiving cattle or cattle under heat stress were inconclusive.

Summary

Three trials were conducted to assess the effects of feeding kelp meal to feedlot cattle. In Trial 1, two commercial feedlots were utilized to determine the effects of kelp meal fed to finishing steers exposed to heat stress. Trial 2 was conducted to evaluate the effects of feeding kelp meal in receiving feedlot steer diets. Trial 3 assessed the effects of kelp meal on performance and carcass characteristics when finishing feedlot heifers were exposed to heat stress. Panting scores were reduced in commercial pens of cattle fed kelp meal while dry matter intakes were maintained. Water intake and dry matter intake were not altered when receiving feedlot steers were fed kelp meal. Physiological responses to heat stress were not altered when finishing heifers were fed kelp meal.

Introduction

Kelp meal has been incorporated into supplements for cattle and swine. Benefits of feeding kelp meal have been hypothesized due to its high mineral and electrolyte content. Research conducted in Missouri and Texas indicated beef cattle grazing infected tall fescue pastures and supplemented with kelp meal had improved immune status and performance, while shelf life of meat products from supplemented steers was increased.

The objectives of these trials were to determine the effects of feeding kelp meal to receiving feedlot steers and finishing steers and heifers on water intake, performance, carcass characteristics and the animal's physiological response to heat stress.

Procedure

Trial 1

Steers in two commercial feedlots (1277 steers, 3 pens/treatment) were used to evaluate effects of feeding finishing steers kelp meal (KM) on heat stress. Kelp meal (Tasco™ -14), *Ascophyllum Nodosum,* is a pure source of seaweed meal harvested off the North Atlantic Coast of Canada and Europe. Tasco™ - 14 is approximately 22% ash on a dry matter basis. Feedlots were located in Northeast Nebraska, approximately 20 miles apart. Treatments were control (no KM; CTRL) or KM at 2.5 % of diet DM (2.5KM). Feedlot operators applied treatments to pens. Trial monitors were unaware of treatment allocation until the trial was complete. Trial days were grouped into 3 periods: pre-treatment (July 3 through July 9), treatment (July 10 through July 19) and post-treatment (8 days after KM was removed). Daily feed intake was recorded and weather data were downloaded from the Northeast Research and Extension Center weather station near Concord, Neb. Behavior data were collected between 1400 and 1600 hour on July 6, July 13 and July 22. Behavior data consisted of panting scores (PS), 0 = no panting; 1 = slightly elevated respiration rate; 2 = moderate respiration rate accompanied by drool or saliva present around mouth; 3 = elevated respiration rate accompanied by moderate amounts of saliva present and/or open mouth; 4 = elevated respiration rate accompanied by open mouth and/or protruding tongue. Infared surface body temperature and PS were recorded on equal number of black, white and red hided cattle per pen. Bunching scores were assigned to pens, 0 = not bunched, 1 = < 10%, 2 = 11 to 25%, 3 = 26 to 50%, 4 = 51 to 75%, and 5 = 76 to 100% bunched.

Table 1. Composition of the control (CTRL) and 1% kelp meal (1KM) in trial 2 receiving study.

	CTRL	1KM
Ingredients		
Alfalfa hay	18	18
Corn silage	15	15
Corn	42	41
Corn bran	20	20
Liquid supplement	4	4
Kelp meal[a]	—	1
Composition		
NE_m, Mcal/lb	.93	.92
NE_g,Mcal/lb	.54	.54
Crude protein, %	13	13

[a]Farmland Industries, Tasco - 14

Trial 2

Two hundred and forty crossbred steer calves were used in a receiving trial at the University of Nebraska Northeast Research and Extension Center, Concord, Neb. Steers arriving on Oct. 24, 2001 were weighed, processed and assigned randomly to pens, (10 head/ pen) on Oct. 25. Pens (n=12) were assigned randomly to either 1) CTRL or 2) KM for four days at 1.0% of diet DM (1KM) with the intent to supplement levels needed to replenish electrolytes depleted due to shipping stress. Receiving diets and composition are shown in Table 1. Supplementation began on Oct. 28, 2001. Data were collected Oct. 26, 2001 through Nov. 15, 2001 and consisted of initial weight and final weight, DMI and water intake.

(Continued on next page)

Trial 3

Ninety-six black hided Angus crossbred yearling heifers were received at the University of Nebraska Northeast Research and Extension Center, Concord, Neb on June 26, 2001. Heifers were weighed, processed and assigned randomly to pens (8 head/pen). Pens (n = 12) were allocated randomly to treatment. Treatments were CTRL, kelp meal fed at 1.0% diet DM for two weeks (1KM) and kelp meal fed at 0.17% diet DM (.17KM) throughout the feeding period. The two different levels of KM were designed with the intent of 1KM steers consuming the same amount of KM as .17KM steers for the trial. The 1KM treatment was applied from July 1 through July 14. Kelp meal was hand mixed into the ration at the bunk. Stowaway XTI data loggers were used to record tympanic temperature during heat stress periods. Tympanic temperatures were obtained from two heifers/pen. Behavior data were recorded between 1500 and 1700 hour and consisted of PS, fly agitation score and bunching score. Bunk scores were recorded at 1100 and 1500 hour. Feed intake was recorded daily and body weights were obtained on days 0, 20, 47 and 69. Heifers were commercially slaughtered on day 70. Hot carcass weight, liver abscess scores, 12th rib fat thickness, USDA yield grade and USDA marbling scores were obtained. Average daily gain and feed efficiency were calculated based on 63% dress.

Performance, carcass characteristics and physiological data were analyzed using General Linear Models procedures of SAS. Least square means were used to separate pen means. Behavior data and liver abscess scores were analyzed using Chi-Square analysis.

Table 2. Climatic Conditions during Trial 1.

Period	Temperature, °F	Relative humidity, %	Wind speed miles/hour	THI[a]
Pre-treatment				
Average	74.8	80.1	8.5	72.3
Maximum	82.8	96.1	11.8	78.0
Minimum	66.8	64.1	5.1	66.5
Treatment				
Average	78.8	67.1	7.7	73.0
Maximum	91.9	93.3	13.5	80.7
Minimum	65.6	40.8	1.8	65.4
Post-treatment				
Average	64.9	77.6	5.4	62.9
Maximum	74.9	99.6	7.6	70.8
Minimum	54.9	53.6	3.2	54.9

[a]Temperature humidity index = T_a - (0.55 - (0.55*(RH/100))) * T_a - 58)

Table 3. Effect of kelp meal supplementation fed at 1% of diet DM (1KM) in receiving steer diets, Trial 2.

	Control	1KM	SE	P-value
Performance, lb				
Initial weight	621	619	7.1	NS
Final weight	726	725	6.8	NS
ADG	4.46	4.47	0.1	NS
DMI, lb				
Treatment	13.85	13.78	0.17	NS
Post-treatment	21.32	21.12	0.23	NS
Average	18.06	18.38	0.26	NS
Water intake, gal/head				
Treatment	3.28	3.37	0.15	NS
Post-treatment	4.98	4.75	0.19	NS
Average	3.67	3.53	0.07	NS

Table 4. Effects of kelp meal supplementation on performance and carcass traits of finishing beef heifers in Trial 3.

	Control	1KM[a]	.17KM[b]	SE	P-value
Performance, lb					
Initial weight	958	958	955	2.3	NS
Final weight[c]	1217	1191	1192	12.1	NS
ADG	3.75	3.38	3.43	0.18	NS
DMI	21.01	21.33	20.66	0.33	NS
Feed:gain	5.66	6.39	6.01	0.32	NS
Carcass Characteristics					
HCW, lb	767	751	751	7.76	NS
Rib fat, in	0.43	0.43	0.40	0.03	NS
Marbling[d]	547	561	572	21.7	NS
Yield grade	2.13	2.19	2.17	0.11	NS

[a]1KM, heifers were fed kelp meal at 1.0% of diet DM for two weeks.
[b].17KM heifers were fed kelp meal throughout the trial at 0.17% diet DM.
[c]Final weight was calculated by adjusting hot carcass weight to a common dressing percentage = 63%.
[d]Marbling score: 500 = small (low choice), 600 = modest (average choice).

Results

Trial 1

Climatic data, recorded from the weather station at Concord, indicate during the pre-treatment and treatment periods steers were exposed to *Danger* conditions based on the Livestock Conservation Institute-temperature humidity index (THI; Table 2). According to Mader and Davis (2002 Plains Nutrition Council Spring Conference, pp 113-114) implementation of emergency heat stress strategies are advised when THI was> 79. Behavior data were collected during the hottest part of the day (1400-1600 hour). The THI were: pre-treatment = 78.0 (alert); treatment = 80.7(danger) and post-treatment 70.8 (normal). During the treatment period, PS based on individual steer observations differed (P = 0.08) with 54% of

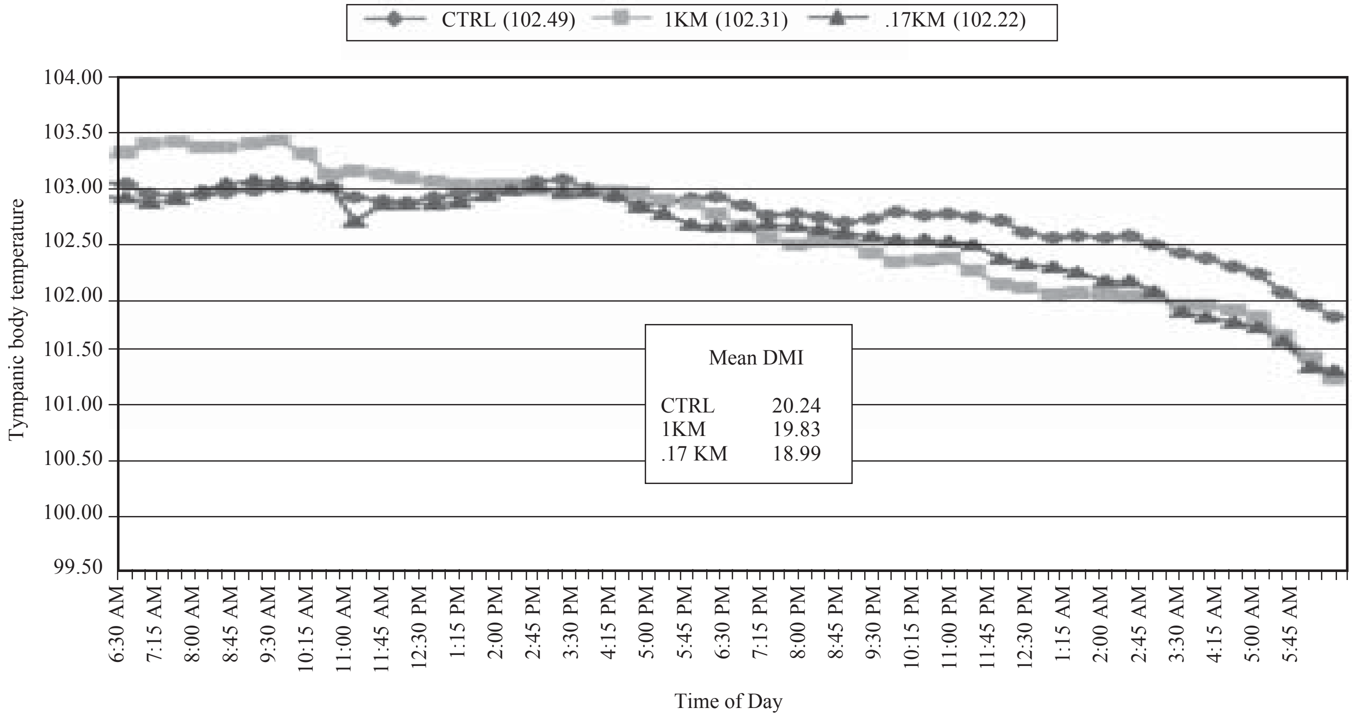

Figure 1. Effects of feeding kelp meal on tympanic body temperature, °F (P > 0.05) and mean DMI for the period body temperature was obtained.

CTRL steers and 33% of 2.5KM steers had PS > 2. Panting scores based on an estimated average for the pen differed (P = 0.001) with 84% CTRL and 68% 2.5KM steers had PS > 2. Bunching scores were not different (P > 0.05). Surface body temperatures were 103.8, 102.4 and 93.9° F, respectively, for the periods with no treatment effect or treatment x period interactions (P > 0.05) found. Body weight was different among the pens. Therefore, intake was analyzed with pre-treatment weight as the covariate (Table 2). During the treatment (19.69 and 19.82 lb) or six-weeks post treatment period (22.87 and 23.06 lb) no difference (P > 0.05) in DMI was observed between steers fed CTRL and 2.5KM, respectively. Feeding kelp meal during periods of heat stress reduced the percentage of steers with panting scores greater than PS1 but did not alter DMI.

Trial 2 and Trial 3

In Trial 2, performance, DMI or water intake (Table 3) in receiving steers fed KM or CTRL diets were not affected (P > 0.05).

In Trial 3, heifer performance, DMI and feed efficiency were not different (P > 0.05) among treatments (Table 4). Numerically, heifers fed CTRL diets had the greatest gains and were the most efficient compared to heifers supplemented with KM. Dry matter intake was greatest for 1KM heifers. There were no differences (P > 0.05) in HCW, 12th rib fat thickness, marbling score, liver abscess score or USDA yield grade among treatments. Bunk score, PS and degree of fly agitation were not different (P > 0.05) among treatments. Heifers fed CTRL diets were (P < 0.06) not bunched before noon, while heifers fed .17KM diets were not (P < 0.05) bunched in the afternoon. During the heat of the day, feeding a low level of kelp meal was beneficial in keeping heifers from bunching indicating they were more comfortable than heifers not receiving kelp meal. Tympanic body temperature did not differ (P > 0.05) among treatment groups (Figure 1).

Performance and carcass characteristics were not enhanced by feeding kelp meal. In commercial feedlots, feeding kelp meal at 2.5% of diet DM reduced panting scores during periods of heat stress without suppressing performance. However, in Trial 3 panting score was not altered by feeding kelp meal. Benefits of feeding receiving cattle or cattle under heat stress kelp meal was inconclusive in regards to enhancing performance or alleviating physiological responses due to heat stress.

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