Kansas Agricultural Experiment Station Research Reports

Volume 1
Issue 1 *Cattlemen's Day*

Article 8

January 2015

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Recommended Citation

Van Bibber, C. L.; Axman, J. E.; Gonzalez, J. M.; and Drouillard, J. S. (2015) "Dietary Chromium Propionate Combined with Yeast Minimally Affects Growth Performance and Carcass Traits of Finishing Steers," *Kansas Agricultural Experiment Station Research Reports*: Vol. 1: Iss. 1. https://doi.org/10.4148/2378-5977.1022

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Introduction

Chromium (Cr) is an essential micromineral that serves to increase absorption of glucose from blood by potentiating the action of insulin. The ability to increase glucose tolerance could lead to more efficient use of glucose and ultimately to improved growth and efficiency. In addition, Cr may be beneficial in improving the immune response of cattle that are subjected to periods of stress. Organic forms of Cr (i.e., Cr propionate) increase absorption and are more physiologically active than their inorganic counterparts. Chromium propionate is currently the only approved form of organic Cr allowed for supplementation in cattle diets in the United States. Yeast supplements, most commonly in the form of various strains of *Saccharomyces cerevisiae*, are commonly added to livestock diets as a means of stimulating digestion, intake, and animal performance. The purpose of this experiment was to compare feedlot performance, carcass characteristics, and plasma glucose profiles of cattle fed finishing diets with and without a combination of chromium propionate and yeast supplementation.

Experimental Procedures

Crossbred steers (n = 504) were selected based on initial plasma glucose concentration. Steers that were deemed to have too-high (i.e., greater than 6.0 mM) plasma glucose concentrations were excluded from the study, and the remaining steers were randomly sorted into two treatment groups. Steers were housed in dirt-surfaced pens equipped with fence-line feed bunks and automatic watering fountains with 21 steers per pen (12 pens per treatment). Cattle were further divided into light and heavy groups (252 animals per weight group) with animals in the 12 lightest pens (6 pens per treatment) constituting the light group and animals in the 12 heaviest pens (6 pens per treatment) constituting the heavy group. Treatments consisted of a control diet in which the steers received only the basal diet, and a treatment group that contained the basal diet with a combination of chromium propionate and yeast (*Saccharomyces cerevisiae*) supplement fed at a rate of 3.3 g/day (CrYeast; Table 1). Feed intakes were monitored daily, and unconsumed feed was removed from the bunk, weighed, and dried at 21-day intervals or as needed to determine actual feed intake. In addition, blood samples were obtained from a subset of animals from each pen (5 steers per pen) on days 49 and 94 to determine plasma glucose concentrations. Body weights were captured for each pen at 21-day intervals. Final body weights (gross body weight × 0.96) were determined immediately before cattle were shipped on the day of harvest. Steers were loaded onto a truck and transported to a commercial abattoir in Holcomb, KS. The steers in the heavy group were shipped after 125 days on feed, and the steers in the lightweight group were shipped after 148 days on feed. Incidence and severity of liver abscesses and hot carcass weights were recorded the day of harvest. USDA yield grade, USDA quality grade, marbling score, 12th-rib fat thickness, ribeye area, and incidence and severity of dark cutting beef were collected after 36 hours of refrigeration.

Results and Discussion

The effects of Cr propionate combined with yeast supplementation on steer performance and carcass traits are shown in Table 2. No interaction between CrYeast supplementation and weight group was observed for dry matter intake ($P = 0.75$). In addition, dry matter intake was unaffected by CrYeast supplementation ($P = 0.18$). A tendency was observed for an interaction between CrYeast and weight group for average daily gain ($P = 0.06$), and a CrYeast × weight group interaction was observed for feed efficiency ($P = 0.03$). Cr propionate was mixed with yeast in our study, therefore precluding our ability to attribute these observations to the individual Cr propionate or yeast components. A tendency for an interaction between Cr-Yeast and weight block was observed for yield grade ($P = 0.08$), and Cr propionate with yeast supplementation tended to reduce marbling scores in both weight groups ($P = 0.07$); however, carcass weight, dressed yield, percentage liver abscesses, ribeye area, and 12th-rib fat were unaffected by treatment ($P > 0.05$). In addition, plasma glucose concentration was not affected ($P > 0.05$) by supplementation (Figure 1). Results for feedlot performance suggest that steers entering the feedlot with a lighter body weight may benefit from Cr propionate combined with yeast supplementation; however, reasons for this are not clearly understood. Lack of differences from heavier cattle may suggest that these cattle received the appropriate amount of bioavailable Cr in the basal diet.

Implications

Chromium supplementation in the form of Cr propionate combined with yeast improved the efficiency of lighter weight finishing cattle but had no further benefit for feedlot performance or carcass traits.

Table 1. Diet composition of steers fed 0 or 3.3 g/day chromium combined with yeast supplementation (dry matter basis)

	Diet[1]			
Item	Step 1	Step 2	Step 3	Finisher
Ingredient, % of diet dry matter				
Steam-flaked corn	20.00	32.64	45.27	57.91
Wet corn gluten feed	30.00	30.00	30.00	30.00
Ground alfalfa	45.91	33.27	20.64	8.00
Vitamin/mineral premix[2]	1.93	1.93	1.93	1.93
Feed additive premix[3]	2.16	2.16	2.16	2.16
Calculated nutrients, % dry matter				
Crude protein	16.15	15.47	14.79	14.12
Neutral detergent fiber	34.98	29.80	24.62	19.44
Ether extract	2.79	3.08	3.37	3.66
Calcium	1.16	1.01	0.85	0.70
Phosphorus	0.46	0.47	0.48	0.48
Potassium	1.14	0.99	0.85	0.70

[1] 6 days/step.
[2] Formulated to provide (as a proportion of total diet dry matter) the following added nutrient levels: 1,000 IU/lb vitamin A; 10 IU/lb vitamin E; 0.10 ppm added cobalt; 10 ppm added copper; 0.6 ppm added iodine; 60 ppm added manganese; 0.25 ppm added selenium; 60 ppm added zinc; and 0.3% salt.
[3] Formulated to provide 300 mg/day Rumensin and 90 mg/day Tylan (Elanco Animal Health, Greenfield, IN) in a ground corn carrier. Chromium propionate combined with yeast (*Saccharomyces cerevisiae*) was included at a feeding rate of 3.3 g/day for the CrYeast treatment. Optaflexx (Elanco Animal Health, Greenfield, IN) was included at a rate of 40 mg/day during the final 30 days for the heavy group and 32 days for the light group prior to harvest.

Table 2. Growth performance and carcass traits of steers separated into light and heavy weight groups and supplemented 0 (Control) or 3.3 g/day chromium propionate combined with *Saccharomyces cervisiae* (CrYeast)[1]

	Light group[‡]		Heavy group[2]			*P*-value		
Item	Control	CrYeast	Control	CrYeast	SEM	CrYeast by weight group	CrYeast	Weight group
Dry matter intake, lb/day	27.70	27.09	28.65	28.28	0.37	0.75	0.18	0.03
Average daily gain, lb/day	3.75	3.88	4.14	4.06	0.07	0.06	0.69	<0.001
Feed:gain	7.41[a]	6.99[b]	6.92[b]	6.97[b]	0.10	0.03	0.08	0.09
Hot carcass weight, lb	877	882	899	897	8.04	0.55	0.73	0.06
Dressed yield, %	63.2	62.8	63.3	63.4	0.004	0.53	0.76	0.39
Total liver abscesses, %	10.4	6.4	16.9	16.8	2.96	0.51	0.49	<0.01
Ribeye area, sq. in.	13.66	13.95	14.43	14.41	0.15	0.25	0.30	< 0.001
12th-rib fat, in.	0.51	0.48	0.50	0.49	0.17	0.50	0.33	0.88
Marbling score[3]	459	453	430	414	4.56	0.45	0.07	<0.001
USDA yield grade	2.79	2.54	2.66	2.66	0.07	0.08	0.08	0.99

[1] 12 steers from the control group and 11 steers from the CrYeast group did not have measurements for 12th-rib backfat due to excessive trim. One animal was condemned at slaughter from the control group because of melanosis.
[2] Heavy group shipped on day 125; light group shipped on day 148.
[3] Marbling scores were obtained by VBG200 camera; slight = 300 to 399, small = 400 to 499.
[ab] Means within a row without a common superscript differ ($P \leq 0.05$).

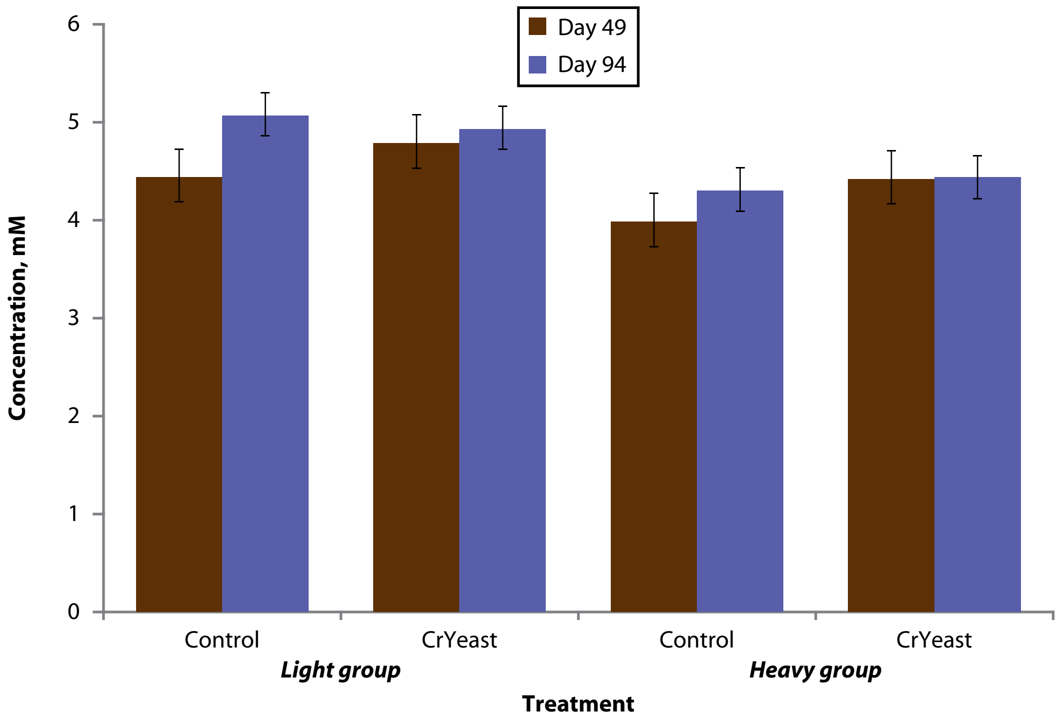

Figure 1. Plasma glucose concentration on days 49 and 94 after steers were separated into light and heavy weight groups and supplemented with 0 (Control) or 3.3 g/day chromium propionate combined with *Saccharomyces cerevisiae* (CrYeast). No interaction, effect of CrYeast, or effect of weight group was found on day 49, $P > 0.05$. No interaction or effect of CrYeast was found on day 94, $P > 0.10$. Day 94 effect of weight group, $P < 0.01$.