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PROGRESS REPORT

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Performance of Finishing Steers and Heifers Fed Steam-flaked Sorghum-based Diets Supplemented With Different Urea Levels¹

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In a survey of six consulting nutritionists, Galyean (1996) reported that percentage of crude protein (CP) in finishing diets ranged from 12.5 to 14.4% with urea levels ranging from .5 to 1.5% of dry matter (DM). Light-weight beef cattle (620 lb) entering the feedlot have improved weight gains and increased hot carcass weights when supplemented with natural protein sources compared with non-protein nitrogen sources (Cosby and Stanton, 1997). Furthermore, using urea may reduce gains because of insufficient undegraded intake protein. However, feed cost is lower for urea-supplemented diets. Our objective was to compare performance and carcass characteristics of feedlot cattle fed steam-flaked sorghum diets containing one of five levels of urea.

Two hundred thirty five medium-framed beef steers and 126 medium-framed heifers (British x Continental) were used in this study. The cattle had previously been fed a 90% concentrate diet during a growing program at the Clayton Livestock Research Center or grazed native range pastures at the Corona Livestock Research Center. Steer and heifer body weights (BW) were obtained on day -1 and were sorted by BW into heavy and light blocks on day 0. On d 0, all cattle were vaccinated with a clostridial antigen and treated for internal and external parasites with Dectomax[®] (doramectin) pour-on. Steers were implanted with Synovex-S, and heifers were implanted with Synovex-H. Treatments were assigned randomly to 30 pens, resulting in six pens per treatment. Treatments included (DM basis): 0%, .5%, 1.0%, 1.5%, and 1.75% added urea. Treatment diets were 90% concentrate diets with steam-flaked sorghum as the grain source (Table 1). Flake weight for the steam-flaked sorghum averaged 30 lb/bushel. Feed bunks were evaluated visually each day of the trail at 0730 to determine the amount of feed to offer each pen. The bunk management approach was designed to allow for 0 to .5 kg of unconsumed feed per pen. Samples of dietary ingredients were taken every two weeks during the experiment to determine DM content. Steers and heifers were weighed individually on day 35, followed by 28-day intervals throughout the experiment. At each weigh period, feed bunks

were swept and any feed remaining in the bunk was weighed and its DM content determined. At the 63-d weigh period, light-block steers and heifers were re-implanted with Synovex-S and Synovex-H, respectively. Heavy block steers and heifers were not re-implanted. The heavy-block were deemed to have sufficient finish after 119 days on feed and were shipped to a commercial slaughter facility. The light-block cattle were shipped to a commercial slaughter facility on day 147. Carcass characteristics obtained included hot carcass weight, marbling score, quality grade, fat thickness measured between 12th and 13th rib, ribeye area, percentage kidney, pelvic and heart fat, and yield grade.

For both steers and heifers, daily DM intake, daily gain, feed gain ratio, and carcass data were analyzed as a random block design with pen as the experimental unit. Orthogonal contrasts were used to test linear, quadratic, cubic, and quartic effects of urea level.

Daily gain data are shown in Tables 2 and 3. No differences ($P > .10$) were observed in the final BW or overall gain in steers across urea levels. For the overall trial, a quadratic response ($P < .05$) was observed for heifers with increasing urea levels (Table 3). Daily gain in heifers receiving 1% urea appears to be the most positive.

Daily DM intake (Table 2) of steers was not influenced by urea level for the overall experiment. Likewise, no differences ($P > .10$) in feed:gain were observed among steers with increasing urea levels for the overall trial. Dry matter intake for heifers (Table 3) revealed no differences ($P > .10$) among urea levels for the overall trial. No difference ($P > .10$) in feed:gain was observed for the overall trial with increasing urea levels for heifers.

Carcass data are shown in Tables 2 and 3. No differences ($P > .10$) were noted in hot carcass weight, dressing percent, ribeye area, fat thickness, marbling score, or yield grade in steers fed increasing urea levels (Table 2). There was however, a linear ($P < .05$) and quartic ($P < .10$) effect on kidney, pelvic, and heart fat with added urea in steers. Response of heifers (Table 3) resulted in a quadratic effect on hot carcass weight ($P < .05$), ribeye area ($P < .10$) and kidney, pelvic, and heart fat ($P < .01$). Those heifers receiving the

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Literature Cited

1.0% urea level were found to have the heavier carcasses. A linear response ($P < .05$) in dressing percent was observed with increasing urea levels. There was also a quadratic and cubic effect of added urea on fat thickness ($P < .05$), ($P < .01$) and yield grade ($P < .01$), ($P < .01$) respectively in heifers. A trend of increased fat thickness and marbling score was observed in heifers receiving .5% urea.

Results of this study suggest that utilization of increased urea levels is varied between sex of finishing beef animals. Steers in this study showed little response in daily gain, dry matter intake or carcass characteristics. The feeding of soybean meal as a natural protein source appeared to have the most positive effect on performance. Performance results of heifers suggest that with steam-flaked sorghum diets, 1% urea resulted in greater gain, numerically greater DM intake and improved feed:gain. It appears at lower urea levels a significant effect occurred on accelerating the function of fat deposition, and enhancing yield grade. One benefit observed in heifers with increasing urea levels was improved dressing percent. In conclusion, it appears that for both heifers and steers fed steam-flaked sorghum diets, using urea levels over 1.0% would not be beneficial.

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Table 1. Ingredient and chemical composition (% of DM) of concentrate diets with different urea levels, fed to finishing beef steers and heifers.

Ingredient/Item	Treatments (% Urea)				
	0	.5	1.0	1.5	1.75
Sudangrass hay	9.55	9.53	9.53	9.53	9.86
Whole Corn	9.58	9.57	9.56	9.56	9.89
Steam-flaked milo	65.23	68.42	69.17	68.68	67.35
Soybean meal	4.88	1.22	0	0	0
Molasses	5.13	5.12	5.12	5.12	5.30
Fat (yellow grease)	2.88	2.88	2.88	2.88	2.97
Limestone	.74	.74	.74	.74	.76
Dical	.49	.49	.49	.49	.50
Salt	.29	.29	.29	.29	.30
Ammonium sulfate	.29	.29	.29	.29	.30
Urea	0	.50	.98	1.48	1.78
Premix ^a	.96	.96	.96	.96	.99
Chemical composition					
Dry matter	84.1	84.0	84.0	83.8	84.3
Ash	5.74	5.17	5.30	5.84	5.42
Crude Protein	12.82	12.41	12.62	13.62	13.93
Acid detergent fiber	11.17	10.04	9.92	10.61	10.60

^aPremix contained (DM basis): wheat midds (90.253%), Vitamin A-30,000 IU/g(.665%), Vitamin E- 500 IU/g (.27%), Rumensin-80 (1.687%), Tylan-40 (1.125%), and trace mineral package (6%). Trace mineral package contained (DM basis) cobalt carbonate (.362%), copper sulfate (3.267%), calcium iodate (.2689%), ferrous sulfate (19.444%), Manganous oxide (6.944%), zinc sulfate (28.169%), magnesium oxide (29.762%), wheat midds (7.831%), and mineral oil (3.949%).

Table 2. Effects of urea level on overall feedlot performance and carcass characteristics by finishing beef steers

Item	Treatments (% Urea)					SE ^a	Contrast ^b
	0	.5	1.0	1.5	1.75		
Initial BW, lb	835.6	835.4	832.9	831.5	832.2	1.8	NS
Final BW, lb	1251.4	1243.4	1231.0	1243.6	1222.7	14.3	NS
Performance							
Daily gain, lb	3.07	3.00	2.93	3.00	2.86	.11	NS
Daily DM intake, lb	20.70	20.62	20.25	20.30	19.51	.45	NS
Feed:gain	6.75	6.89	6.91	6.80	6.84	.13	NS
Carcass characteristics							
Hot carcass wt., lb	772.0	768.3	760.8	766.9	755.2	7.87	NS
Dressing percent	61.7	61.7	61.8	61.7	61.8	.21	NS
Ribeye area sq. in.	13.18	13.41	13.14	13.28	13.35	.19	NS
KPH, %	2.29	2.30	2.19	2.26	2.15	.03	L (.05) Qt (.10)
Fat thickness, in.	.47	.41	.42	.43	.44	.02	NS
Marbling score ^c	47.6	45.4	47.0	46.5	43.0	2.04	NS
Yield grade	2.84	2.61	2.66	2.68	2.62	.10	NS

^a Pooled standard error of treatment means, n = four pens per treatment.

^b Observed significance level (in parentheses) for linear (L), quadratic (Q), cubic (C), and quartic (Qt) contrasts. NS = non-significant (P > .10).

^c 30 = Slight⁰; 40 = Small⁰; 50 = Modest⁰.

Table 3. Effects of urea level on overall feedlot performance and carcass characteristics by finishing beef heifers

Item	Treatments (% Urea)					SE ^a	Contrast ^b
	0	.5	1.0	1.5	1.75		
Initial BW, lb	759.1	758.0	763.9	759.3	760.4	8.4	NS
Final BW, lb	1162.1	1186.3	1217.3	1180.1	1174.3	17.4	Q (.05)
Performance							
Daily gain, lb	2.96	3.17	3.31	3.09	3.05	.14	Q (.05)
Daily DM intake, lb	20.23	21.47	22.51	21.93	21.04	1.06	NS
Feed:gain	6.83	6.80	6.80	7.10	6.89	.34	NS
Carcass characteristics							
Hot carcass weight	712.4	733.6	751.9	731.8	733.5	10.84	Q (.05)
Dressing percent	61.3	61.9	61.4	62.0	62.4	.35	L (.05)
Ribeye area sq. in.	14.75	13.76	14.54	14.57	14.80	.29	Q (.10)
KPH, %	2.34	2.46	2.63	2.35	2.31	.09	Q (.01)
Fat thickness, in.	.33	.48	.40	.39	.40	.03	Q (.05), C (.01)
Marbling score ^d	45.6	48.3	46.9	45.4	46.8	1.97	NS
Yield grade	1.79	2.57	2.23	2.07	2.02	.14	Q (.01), C (.01)

^a Pooled standard error of treatment means, n = two pens per treatment.

^b Observed significance level (in parentheses) for linear (L), quadratic (Q), cubic (C), and quartic (Qt) contrasts. NS = non-significant (P > .10).

^c 30 = Slight⁰; 40 = Small⁰; 50 = Modest⁰.