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PROGRESS REPORT

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Effects of Proportions of Steam-Flaked Corn and Steam-Flaked Milo on Performance and Carcass Characteristics of Finishing Beef Steers[1]

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The majority of feedlots in the Great Plains region of the United States feed highly processed grains, including either steam-flaked corn or steam-flaked milo in finishing cattle diets. Mixtures of steam-flaked corn and steam-flaked milo are frequently used in finishing diets. However, many times the proportions fed are based on least-cost analysis of the grain sources. Data are limited evaluating the effects of proportions of steam-flaked corn and steam-flaked milo on performance by finishing beef cattle. Our objective was to evaluate the effects of steam-flaked corn and steam-flaked milo proportions on performance and carcass characteristics of finishing beef steers.

One hundred eighty medium-framed beef steers (British x Continental) were selected from a group of 370 steers. Steers were sorted by body weight (**BW**) into heavy and light blocks. The steers had previously grazed improved pastures or were fed a 90% concentrate diet at restricted intake during a growing program at the Clayton Livestock Research Center. Steers were adapted to a 90% concentrate diet for at least 2 weeks. Approximately 2 weeks before the start of the experiment, steers were weighed, implanted with Synovex-S and vaccinated with a Clostridial antigen. One week before the start of the experiment, steers were treated for internal and external parasites with Ivomec pour on and fed a 90% concentrate diet in an amount sufficient to provide ad libitum consumption. Steer BW were obtained, and steers were sorted into their respective pens on d 0. Steer BW were stratified such that each pen had equal average BW. Treatments were assigned randomly to 20 pens, resulting in four pens of nine steers each per treatment diet. Treatments included (dry matter [**DM**] basis) 100% steam-flaked corn:0% steam-flaked milo (**100:0**), 75% steam-flaked corn 25% steam-flaked milo (**75:25**), 50% steam-flaked corn:50% steam-flaked milo (**50:50**), 25% steam-flaked corn:75% steam-flaked (**25:75**), and 0% steam-flaked corn:100% steam-flaked milo (**0:100**; Table 1). Bushel weight of the steam-flaked corn and steam-flaked milo was determined at 2-h intervals during the flaking process. Feed bunks were evaluated visually each day of the trial 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. Computer records for each pen were available when feed bunks were evaluated. Feed was mixed in the order of 100:0, 75:25, 50:50, 25:75, and 0:100 treatments. Samples of dietary ingredients were taken every 2 weeks during the experiment to determine DM content. Steers were weighed individually at 28-day intervals throughout the experiment. At each 28-day weigh period, feed bunks were swept, and any feed remaining in the bunk was weighed and its DM content determined. At the 56-day weigh period, light-block steers were re-implanted with Synovex-Plus; heavy-block steers were not re-implanted. Steers in the heavy block were deemed to have sufficient finish after 84 days on feed and were shipped to a commercial slaughter facility. Light-block steers were shipped to a commercial slaughter facility on day 147. Carcass characteristics obtained included hot carcass weight, rib eye area, percentage of kidney, pelvic, and heart fat, fat thickness measured between 12th and 13th rib, marbling score, and yield grade.

Table 1. Composition (% of DM) of finishing diets

	Treatment (Corn:Milo)				
Ingredient	100:0	75:25	50:50	25:75	0:100
Sudangrass hay	10.31	10.33	10.31	10.30	10.28
Whole corn	10.13	10.12	11.12	11.86	12.59
Steam-flaked corn	63.44	48.44	32.20	16.06	
Steam-flaked milo		16.25	32.52	48.70	64.81
Soybean meal	3.79	2.52	1.50	.75	0
Molasses	5.34	5.33	5.32	5.31	5.31
Fat (yellow grease)	3.14	3.15	3.15	3.14	3.14
Limestone	.76	.77	.77	.77	.76
Dicalcium phosphate	.50	.50	.50	.51	.51
Salt	.30	.30	.30	.31	.31
Urea	1.02	1.02	1.03	1.03	1.02
Ammonium sulfate	.25	.25	.25	.25	.25
Premix[a]	1.02	1.02	1.03	1.02	1.02

[a]Premix 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): calcium iodate (.269%), cobalt carbonate (.362%), copper sulfate (3.268%), ferrous sulfate (19.445%), magnesium oxide (29.762%), manganous oxide (6.944%), zinc sulfate (28.169%), wheat midds (7.831%), and mineral oil (3.95%).

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Daily DM intake, daily gain, feed gain ratio, calculated NE_m, NE_g, and ME values (NRC, 1996), and carcass data were analyzed as a randomized block design with pen as the experimental unit. Orthogonal contrasts were used to test linear, quadratic, cubic, and quartic effects of proportions of steam-flaked milo.

Performance data are shown in Table 2. Increasing the proportion of steam-flaked milo in the finishing diet decreased average daily gain (linear; $P < .10$) for days 0 to 28 of the finishing period. No other significant differences in average daily gain were observed in this experiment. A quadratic effect ($P < .04$) of increasing the proportion of steam-flaked milo in the finishing diet was observed for daily DM intake for days 0 to 28. No differences were observed for days 28 to 56 or for days 84 to 112. Linear increases in daily DM intake were observed ($P < .10$) for days 56 to 84 and days 112 to 140 when steam-flaked milo replaced steam-flaked corn in the finishing diet; however, no differences were noted for daily DM intake for the overall experiment. Increasing the proportion of steam-flaked milo in the finishing diet resulted in poorer feed:gain ratio for days 0 to 28. No differences among treatments were noted for days 28 to 56, 56 to 84, 84 to 112 or 112 to 140. However, for the overall experiment, increasing the proportion of steam-flaked milo in the finishing diet resulted in a linear increase ($P < .01$) in the feed:gain ratio. Moreover, increasing the proportion of steam-flaked milo in the finishing diet resulted in a linear decrease ($P < .01$) in calculated NE_m, NE_g and ME values of the diet.

No differences ($P > .10$) were noted among treatments for hot carcass weight, dressing percent, ribeye area, percentage of kidney, pelvic and heart fat, fat thickness, or marbling score (Table 2). There was a quartic effect ($P < .03$) of treatment for yield grade; however, the biological significance of this effect is doubtful.

Results from the present experiment suggest that replacing steam-flaked corn with approximately 25% steam-flaked milo in a finishing diet decreased feed efficiency (as measured by the feed:gain ratio and NE_g) by approximately 4%. Conversely, little benefit was noted by replacing steam-flaked milo with 25% steam-flaked corn in finishing diets. There was a 1.6% improvement in the feed:gain ratio by replacing approximately 50% of the steam-flaked milo with steam-flaked corn compared with the 100% steam-flaked milo diet. Feeding finishing steers diets with 100% of the grain source as steam-flaked milo resulted in approximately 8% poorer feed:gain ratio and a 6.5% decrease in calculated NE_g. Other factors may play a role in the economics of using steam-flaked milo vs steam-flaked corn in finishing diets, including mill production rate and roller wear.

Literature Cited

NRC. 1996. Nutrient Requirements of Beef Cattle (7th Ed.). National Academy Press, Washington, DC.

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Table 2. Effects of proportions of steam-flaked corn and steam-flaked milo on performance and carcass characteristics of beef steers

	Treatment (Corn:Milo)						
Item	100:0	75:25	50:50	25:75	0:100	SE[a]	Contrast[b]
Initial BW, lb	783.7	786.6	784.7	786.1	779.8	2.87	
Final BW, lb	1266.6	1272.5	1243.6	1260.0	1246.6	11.97	
Daily gain, lb							
Days 0 to 28	5.66	5.55	5.36	5.46	5.07	.205	L (.10)
Days 28 to 56	4.33	4.22	4.08	4.13	4.15	.228	NS
Days 56 to 84	3.73	3.83	3.45	3.55	3.78	.203	NS
Days 84 to 112	3.38	3.50	3.44	3.60	3.42	.118	NS
Days 112 to 140	3.46	3.95	3.37	3.59	3.62	.397	NS
Days 0 to end	4.25	4.23	4.04	4.13	4.08	.105	NS
Daily DM intake, lb/steer							
Days 0 to 28	19.93	20.49	20.16	21.43	20.21	.323	Q (.04)
Days 28 to 56	23.43	24.00	23.07	23.89	23.57	.592	NS
Days 56 to 84	22.48	23.69	23.05	23.68	24.33	.432	L (.03)
Days 84 to 112	20.28	21.91	21.82	22.06	21.67	.634	NS
Days 112 to 140	19.92	21.88	19.41	21.58	21.53	.451	L (.10)
Days 0 to end	22.04	22.77	22.15	22.99	22.78	.381	NS
Feed:gain							
Days 0 to 28	3.52	3.70	3.76	3.93	4.02	.156	L (.04)
Days 28 to 56	5.43	5.83	5.74	5.83	5.78	.281	NS
Days 56 to 84	6.11	6.23	6.69	6.81	6.48	.357	NS
Days 84 to 112	6.01	6.28	6.35	6.14	6.33	.257	NS
Days 112 to 140	5.76	5.59	6.02	6.01	5.97	.598	NS
Days 0 to end	5.17	5.38	5.49	5.56	5.58	.096	L (.01)
NE_m, Mcal/kg of dietary DM	2.22	2.15	2.14	2.10	2.10	.024	L (.01)
NE_g, Mcal/kg of dietary DM	1.54	1.48	1.47	1.44	1.44	.021	L (.01)
ME, Mcal/kg of dietary DM	3.23	3.14	3.13	3.09	3.08	.030	L (.01)
Hot carcass wt, lb	767.1	768.9	762.2	770.4	754.6	8.2	NS
Dressing percent	60.6	60.5	61.4	61.2	60.6	.33	NS
Ribeye area, sq. in.	13.90	13.58	14.14	13.99	13.79	.175	NS
KPH, %	2.33	2.31	2.26	2.21	2.28	.048	NS
Fat thicknes, in.	.44	.45	.44	.44	.42	.023	NS
Marbling score[c]	39.3	42.8	41.8	40.9	43.1	1.58	NS
Yield grade	2.54	2.67	2.39	2.50	2.46	.058	QUART (.03)

[a]Pooled standard error of treatment means, n = four pens per treatment for days 0 to 28, 28 to 56, 56 to 84 and 0 to end; n= two pens per treatment for days 84 to 112 and 112 to 140.

[b]Observed significance level (in parentheses) for linear (L) and quadratic (Q) contrasts. NS = non-significant (P > .10).

[c]30 = Slight^0; 40 = Small^0: 50 = Modest^0.