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Effects of Zilmax on performance, carcass characteristics, and speed of movement of crossbred steers consuming rations with different concentrations of urea

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Zilmax (Merck Animal Health, Summit, NJ) is a beta-adrenergic agonist commercially used to increase animal performance in the beef finishing industry. Greater animal performance associated with use of repartitioning agents, such as Zilmax, could alter livestock nutrient requirements. The objective of this study was to evaluate the effects of Zilmax on performance, carcass characteristics, and speed of movement of crossbred steers consuming rations with increasing concentrations of ruminally degradable protein supplied as urea.

All procedures were approved by the Institutional Animal Care and Use Committee at New Mexico State University. At approximately 155 days on feed, 429 steers were weighed individually, and sorted into blocks based on body weight. Pens of cattle received a standard feedlot finishing ration containing 0.5% urea (and no Zilmax) until 27 days before harvest, at which time the finishing ration was replaced with either Zilmax or no Zilmax and 1 of 3 dietary treatments (Table 1). After pens of cattle were weighed, dietary treatments were initiated and fed for 24 days, followed by a 3-day withdrawal during which cattle did not receive Zilmax. Cattle were fed twice daily, and Zilmax treatments were top-dressed onto the finishing ration in the feed bunk to supply 75 mg zilpaterol hydrochloride per steer daily.

Daily feed offered was recorded and diet samples were collected weekly to calculate dietary dry matter and determine nutrient content. Feed refusals were collected as needed and analyzed for dry matter content to adjust daily dry matter intake. On the day of harvest an all-terrain vehicle was utilized to move cattle from their assigned pens to the scale platform, and a stopwatch was used to record the time for cattle to walk from their pens to the scale. The timer began once the pen gate was opened and stopped once all of the cattle had reached the pen scale platform. In addition to length of time required for each pen of cattle to reach the platform, the distance from each pen to the scale platform was recorded. Once pen weights were recorded, cattle were loaded and transported to the processing plant (Tyson Fresh Meats, Amarillo, TX).

Steers were harvested and hot carcass weights and liver scores were recorded. Measurements for carcass characteristics and liver scores were collected by personnel from the Beef Carcass Research Center (West Texas A&M University, Canyon, TX). Carcasses were chilled for approximately 24 hours and individual carcass measurements were collected.

No interactions between Zilmax and dietary urea were observed for performance or carcass response variables (Table 2). In this study, the finishing diets contained 0%, 0.5%, and 1.0% urea (dry matter basis) to supply an estimated 7.3%, 8.4%, and 9.7% ruminally degradable protein (Table 1). Lack of interaction between Zilmax and dietary urea suggests that feeding Zilmax did not increase the requirements of ruminally available nitrogen above the 8.4%. Additionally, no Zilmax by urea interactions were observed for time to the scale or feet per second traveled (Table 2).

Increasing urea in the ration linearly decreased both dry matter intake and average daily gain, and did not affect feed-to-gain ratio (Table 2). The decrease in average daily gain is likely due to lower dietary energy intake. The greatest numerical decreases in both dry matter intake and average daily gain occurred when urea was increased from 0.5% to 1.0% of the diet, perhaps due to an excess supply of ammonia. Hot carcass weights tended to decrease linearly with increasing urea concentration, likely due to decreased performance. Dressing percentage, 12^{th} rib fat depth, rib-eye area, kidney-pelvic-heart fat, yield grade, percentage of carcasses grading Choice or better, and incidence of liver abscesses were not affected by increasing level of urea. A tendency for a quadratic effect on marbling was observed as the concentration of urea increased in the ration. Mobility was not affected among cattle fed rations with different urea concentrations.

Steers fed Zilmax had 6% lower dry matter intakes, 16% greater daily gains, and 19% lower feed-to-gain ratios than steers receiving no Zilmax. Cattle receiving diets containing Zilmax had hot carcass weights that were approximately 32 pounds heavier than those not receiving Zilmax. Additionally, dressing percentage of cattle treated with Zilmax was improved by approximately 3.7%. Feeding Zilmax did not affect marbling score, 12th rib fat depth, kidney-pelvic-heart fat, percentage of carcasses grading Choice or better, and incidence of liver abscesses. However, cattle receiving Zilmax had greater rib-eye area as well as improved yield grade when compared to cattle not receiving Zilmax, suggesting that Zilmax more directly affected protein deposition in this study. The time for cattle to walk from their pens to the scale and feet per second traveled were not affected by the addition of Zilmax to finishing rations. Steer morbidity and mortality were 0% during the 27-day experimental period.

The results of this study indicate that cattle receiving Zilmax during the last 24 days of the finishing period do not require additional ruminally degradable intake protein to maximize performance. Additionally, excess ruminally available nitrogen (as urea) may decrease finishing cattle performance, regardless of whether Zilmax was included in the ration. Feeding Zilmax during the last 24 days of the feeding period improved performance, hot carcass weight, dressing percentage, and rib-eye area, and did not decrease carcass fat deposition to the same extent that has been reported previously. Additionally, providing Zilmax did not alter speed at which steers walked from their feedlot pens to a scale platform before shipment to a commercial beef processing plant.

Table 1. Ingredient and nutrient concentrations of dietary treatments

	Dietary Treatments		
Item	0%Urea	0.5%Urea	1.0%Urea
Ingredient, % DM			
Flaked corn	60.99	61.01	60.95
Sweetbran	18.66	18.67	18.65
Corn stover	8.12	8.12	8.11
DDGS	9.35	9.82	8.91
Urea	-	0.49	0.98
Supplement	2.36	2.36	2.36
Nutrient Analysis[1]			
CP, % DM	13.7	14.4	15.8
RDP, % DM	7.3	8.4	9.7
RUP, % DM	6.3	6.0	6.1

[1]RDP = ruminally degradable protein; RUP = ruminally undegradable protein.

Table 2. Effects of Zilmax and urea concentrations in finishing rations on performance, carcass characteristics, and speed of movement of crossbred steers.

	Treatments					
	No Zilmax			Zilmax		
	0%Urea	0.5%Urea	1.0%Urea	0%Urea	0.5%Urea	1.0%Urea
Pens	6	6	6	6	6	6
Performance						
Initial body weight, lb	1197	1185	1201	1196	1199	1177
Final body weight, lb	1252	1239	1250	1262	1263	1231
Dry matter intake, lb/day	19.7	19.5	18.5	18.6	18.6	16.7
Gain, lb/day	2.03	2.00	1.83	2.44	2.40	1.98
Feed-to-gain ratio	9.74	10.07	10.14	7.70	7.88	8.56
Carcass characteristics						
Hot carcass weight, lb	812	803	798	839	841	831
Dressing %	64.8	64.8	63.8	66.4	66.5	67.7
Marbling score	42.1	45.1	44.2	44.0	45.3	43.3
12th rib fat depth, in.	0.45	0.53	0.49	0.50	0.48	0.48
Rib-eye area, sq. in.	13.9	13.6	13.6	14.8	14.6	14.8
KPH fat, %	1.86	1.81	1.82	1.82	1.87	1.77
Yield grade	2.64	2.86	2.78	2.56	2.61	2.49
Choice or better, %	56.0	66.0	58.0	63.4	59.2	57.2
Liver abscesses, %	20.4	17.3	13.0	10.4	9.92	19.6
Speed of movement						
Distance, ft	469	467	469	466	463	459
Total time, min	2.28	2.26	2.30	2.20	2.58	2.73
Feet per sec traveled	3.46	3.43	3.53	3.68	2.97	3.00