Lubabegron and betaine for finishing steers: Impacts on growth performance and carcass traits

Pauliane Pucetti[1], Christy A. Finck[1], Kasey R. Maddock-Carlin[1], Zachary E. Carlson[2], Nathan Pyatt[3] and Kendall C. Swanson[1]

Lubabegron (Experior®) improved feed efficiency and carcass yield in finishing steers without increasing feed intake, supporting its potential for enhancing profitability. Trends for interactions with betaine (Betafin®) suggest that combining both additives may provide additional carcass benefits worth further investigation.

Summary

This study evaluated the effects of lubabegron (Experior®, 0.032% DM for 56 days) and betaine (Betafin®, 0.28% DM for seven days) on feedlot performance and carcass traits of finishing steers. Lubabegron improved feed efficiency and increased hot carcass weight without affecting feed intake. Betaine alone had no effect, but a trend for an interaction with lubabegron on dressing percentage suggests possible additive benefits. These results indicate that lubabegron may be an effective nutritional strategy to enhance carcass yield and nutrient utilization in finishing cattle.

Introduction

Improving the productivity, efficiency and sustainability of beef cattle production is an ongoing priority for both producers and the livestock industry. One strategy to support this goal is the use of feed additives that can enhance growth performance, improve feed efficiency and increase carcass yield.

Lubabegron (Experior®; Elanco Animal Health), approved by the FDA in 2018, is a β-adrenergic modulator used during the final 14-91 days of finishing. Unlike traditional β-agonists, lubabegron stimulates β_3-receptors while blocking β_1 and β_2, promoting lean tissue accretion with fewer cardiovascular side effects. Research has shown that lubabegron improves feed efficiency, increases hot carcass weight (HCW) and reduces ammonia emissions (Kube et al., 2021).

Betaine (Betafin®; Danisco Animal Nutrition and Health) is another additive that can influence growth performance and nutrient utilization. It acts as an osmolyte, maintaining cellular hydration and preserving enzyme function, and as a methyl donor in one-carbon metabolism, aiding in protein synthesis, liver function and growth. In beef cattle, betaine supplementation has been linked to improvements in dry matter intake and sometimes carcass yield, although results vary depending on diet and environment (Abhijith et al., 2024).

Because lubabegron and betaine act through different mechanisms, they may offer complementary benefits. However, little is known about their combined effects in finishing cattle. Therefore, this study was conducted to evaluate the individual and combined effects of lubabegron and betaine on dry matter intake, feed efficiency, HCW and carcass dressing percentage in finishing steers.

Experimental Procedures

All procedures were approved by the North Dakota State University Institutional Animal Care and Use Committee. Sixty steers (initial body weight [BW] = 1050 ± 11.6 lbs; commercial crossbred and Angus) were housed at the NDSU Beef Cattle Research Complex (Fargo, ND) and stratified by BW into two blocks: a heavier group (n = 38; 119-day feeding period; BW = 1101 ± 10.0 lbs) and a lighter group (n = 22; 147-day feeding period; BW = 966 ± 12.4 lbs). Steers were randomly assigned to one of four treatments in a 2 × 2 factorial arrangement: the control group (no additive; n = 16), Lubabegron (0.032% of dietary dry matter [DM] for 56 days, followed by a seven-day withdrawal; n = 14) and Betaine (0.28% of dietary DM for the final seven days; n = 15) and Lubabegron + Betaine (n = 15).

Diets were formulated using the empirical solutions model of the Beef Cattle Nutrient Requirements Model, 2016 (NASEM, 2016) to contain approximately 10% roughage and 90% concentrate on a dry matter basis with the following ingredients: corn grain (60%), DDGS (20%), corn silage (10%), grass hay (5%), limestone (1.5%), urea (0.95%), salt (0.10%), fine

[1]Department of Animal Sciences, NDSU
[2]Danisco Animal Nutrition and Health, IFF Inc.
[3]Elanco Animal Health

ground corn (2.1-2.3%), monensin (0.02%), vitamin premix (0.01%) and trace mineral premix (0.05%). Both additives were incorporated by partially replacing fine-ground corn in the supplement premix.

Steers were weighed at trial initiation (two consecutive days), every 28 days and at key time points during supplementation (days -1, 0, 28, 55 and 56 for Lubabegron; days -1, 0, 6 and 7 for Betaine). On day one, steers were implanted with 200 mg trenbolone acetate + 20 mg estradiol-17β (Component™ TE-200, Elanco, Greenfield, IN). Individual daily feed intake was measured using an automated feed system (Insentec Roughage Intake Control, Hokofarm B.V., Marknesse, Netherlands). Weekly ingredient samples were dried (60 degrees Celsius, 48 hours), ground (1-mm screen, Wiley mill), composited and analyzed for nutrient composition. At the end of the trial, steers were transported to a federally inspected slaughter facility.

Data were analyzed using the MIXED procedure of SAS (SAS Institute, Cary, NC) as a randomized complete block design with a 2 × 2 factorial arrangement. Marketing group was included as a random blocking factor, and initial BW at the start of supplementation was included as a covariate. Isolated additive effects and their interaction were tested, with significance at $P \leq 0.05$ and trends at $0.05 < P \leq 0.10$.

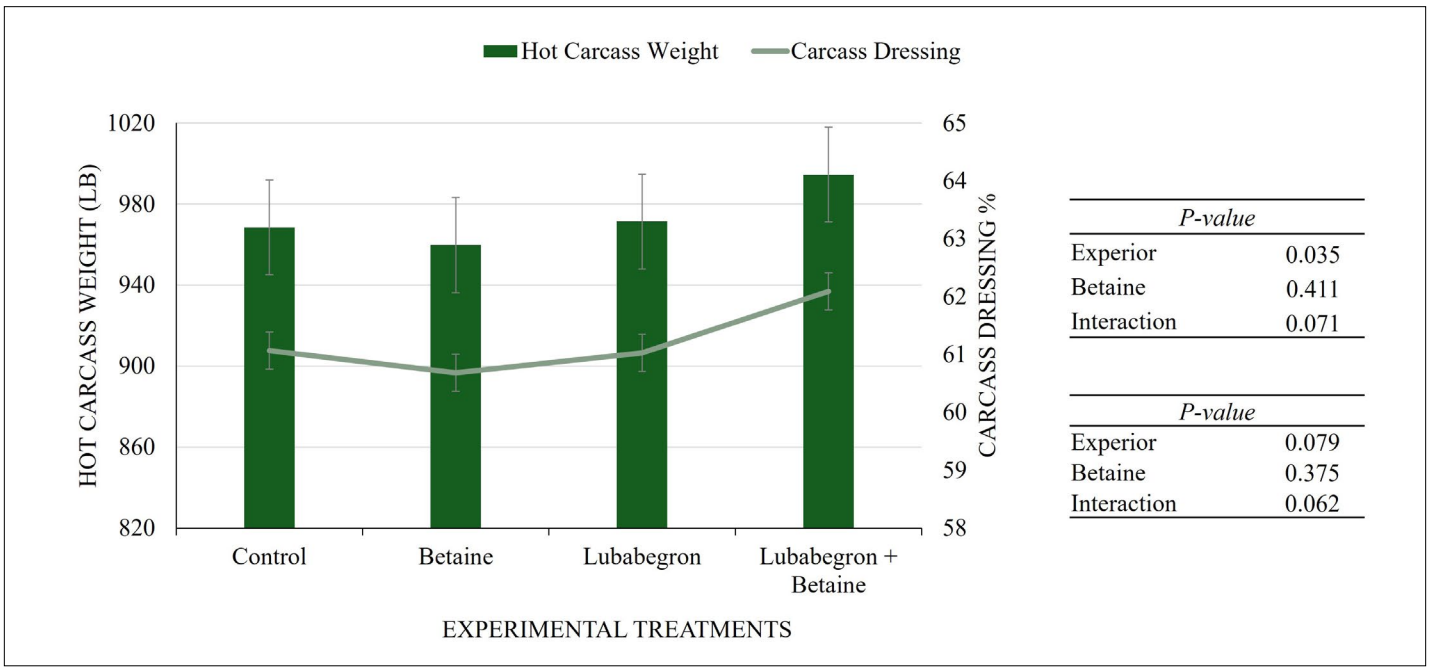
Results and Discussion

There were no treatment effects on initial BW, presupplementation BW or final BW ($P > 0.10$; Table 1), confirming that steers were well balanced at the beginning of the trial and that final live weight was not influenced by the additives. Hot carcass weight was greater in steers receiving lubabegron ($P = 0.035$; Figure 1), and a tendency for a lubabegron × betaine interaction was observed ($P = 0.071$). This suggests a potential additive or synergistic effect, although the interaction was not statistically significant. The increase in HCW with lubabegron is consistent with its β_3-adrenergic activity, which promotes lean tissue accretion. A similar pattern was observed for carcass dressing percentage, which tended to be greater in lubabegron-fed steers ($P = 0.079$), with a trend for an interaction ($P = 0.062$).

Table 1. Body weight, dry matter intake and average daily gain of finishing steers supplemented with Lubabegron (Experior®) and/or Betaine (Betafin®).

Item	Control	Betaine	Lubabegron	Lubabegron + Betaine	SEM[1]	*P-value*[2]		
						Lubabegron	Betaine	Interaction
***Body weight*[3], lb**								
Initial	1039	1028	1028	1034	70	0.894	0.887	0.613
Pre-Supplementation	1322	1336	1307	1322	19	0.463	0.463	0.967
Final	1584	1581	1587	1600	40	0.316	0.652	0.468
***Dry matter intake*[4], lb/d**								
Pre-Supplementation	26.8	28.0	27.9	27.8	0.85	0.292	0.194	0.144
Lubabegron + Betaine	31.6	32.5	30.9	31.8	0.89	0.239	0.148	0.977
Lubabegron	31.6	32.6	30.8	31.8	0.83	0.220	0.123	0.988
Total	29.1	30.2	29.3	29.7	1.04	0.749	0.138	0.532
***Average Daily Gain*[4], lb/d**								
Pre-Supplementation	4.01	4.32	3.98	4.03	0.13	0.261	0.211	0.34
Lubabegron + Betaine	4.15	4.10	4.20	4.41	0.64	0.315	0.645	0.467
Lubabegron	4.32	4.27	4.47	4.74	0.44	0.052	0.493	0.309
Total	4.12	4.26	4.13	4.27	0.29	0.962	0.253	0.984
Gain:feed								
Pre-Supplementation	0.150	0.155	0.143	0.146	0.0078	0.085	0.472	0.777
Lubabegron + Betaine	0.131	0.125	0.136	0.138	0.0166	0.038	0.713	0.352
Lubabegron	0.137	0.131	0.145	0.149	0.0105	<0.001	0.749	0.156
Total	0.141	0.141	0.141	0.144	0.0050	0.784	0.644	0.585

[1]Standard error of the mean
[2]*P*-values represent the main effects of Lubabegron (Experior®), Betaine (Betafin®), and their interaction (Lubabegron × Betaine
[3]Body weight is presented at three timepoints: initial (trial start), pre-supplementation (start of additive feeding), and final (end of finishing period)
[4]Reported for the pre-supplementation period, during the Lubabegron and Betaine supplementation (last 63 days), during Lubabegron supplementation (56 days), and for the total finishing period.



	P-value
Experior	0.035
Betaine	0.411
Interaction	0.071

	P-value
Experior	0.079
Betaine	0.375
Interaction	0.062

Figure 1. Hot carcass weight and carcass dressing percentage of finishing steers fed diets with or without Lubabegron (Experior®) and/or Betaine (Betafin®). *P*-values represent the main effects of Lubabegron, Betaine and their interaction.

Dry matter intake was not affected by treatment during the presupplementation period, the lubabegron supplementation phase or the total finishing period ($P > 0.10$; Table 1). These results indicate that performance responses were not driven by changes in feed intake, but rather by differences in nutrient utilization.

Lubabegron tended to increase ADG during the 56-day supplementation period ($P = 0.052$; Table 1), suggesting a potential improvement in growth performance associated with its β_3-adrenergic activity. No effects on ADG of betaine or the lubabegron × betaine interaction were observed during this period ($P > 0.10$). During the presupplementation period, no effects of lubabegron, betaine or their interaction were detected ($P > 0.10$). Similarly, total ADG across the entire feeding period was not influenced by either additive or their interaction ($P > 0.10$).

The gain-feed ratio tended to be lower for steers assigned to the lubabegron group during the presupplementation period ($P = 0.085$; Table 1). Although the cause for this reduction is unclear, the effect was not sustained after supplementation began. Lubabegron supplementation increased gain:feed during the 56-day treatment window ($P < 0.001$) and also during the last 63 days of the finishing period ($P = 0.038$). No effects of betaine or the lubabegron × betaine interaction were observed on gain:feed in any period ($P > 0.10$).

In conclusion, lubabegron improved feed efficiency and hot carcass weight without increasing intake. Although betaine alone had no effect, a trend for an interaction with lubabegron suggests additive potential. Additional studies are needed to clarify these responses and optimize combined supplementation.

Acknowledgments

We thank Elanco Animal Health for providing Experior® (lubabegron) and Component™ TE-200 implants and Danisco Animal Nutrition (IFF) for providing Betafin® (betaine) for use in the study. We also thank the staff and students at the NDSU Beef Cattle Research Complex and Animal Sciences Nutrition Laboratory for their assistance.

References

Abhijith, A., F. R. Dunshea, S. S. Chauhan, V. Sejian, and K. DiGiacomo. 2024. A meta-analysis of the effects of dietary betaine on milk production, growth performance, and carcass traits of ruminants. Animals. 14:1756.

Kube, J. C., B. P. Holland, A. B. Word, J. B. Allen, M. Calvo-Lorenzo, D. McKenna, and G. Vogel. 2021. Effects of various doses of lubabegron on calculated ammonia gas emissions, growth performance, and carcass characteristics of beef cattle during the last 56 days of the feeding period. Transl. Anim. Sci. 5:txab210.

NASEM (National Academies of Sciences, Engineering, and Medicine). 2016. Nutrient requirements of beef cattle (8th ed.). Washington, DC: The National Academies Press.