OXFORD ACADEMIC

Journal of ANIMAL SCIENCE

AMERICAN SOCIETY OF ANIMAL SCIENCE

Article Navigation

PSXIV-22 Impact of fibrolytic enzymes on performance, metabolism, and feeding behavior of feedlot cattle fed diets containing different levels and sources of roughage

Ludmila de Souza Monteiro, João Vitor Pessoa Fiório, Jéssica Olivier Da Silva, Daniel Silva Antonelo, Nicola Walker

Journal of Animal Science, Volume 97, Issue Supplement_3, December 2019, Pages 435–436,
https://doi.org/10.1093/jas/skz258.862
Published: 05 December 2019

Cite Permissions Share ▼

Abstract

Two experiments were conducted to evaluate finishing performance, carcass characteristics, total tract diet digestibility, ruminal parameters, and feeding behavior of bulls fed high-concentrate feedlot diets containing two sources and two levels of roughage, with or without exogenous fibrolytic enzyme (EFE). For the performance study, 264 Nellore bulls (371 ± 18.7 kg) were distributed in 48 pens by initial body weight in a randomized complete block design with a 2 × 2 × 2 factorial treatment arrangement. Diets contained (dry matter basis) 0 or 0.75 mL/kg of EFE (ABVista, Marlborough, UK); and 8.5 or 12.5% either sugarcane bagasse (SCB) or grass hay (GH). Dry matter intake was greater for bulls fed 12.5% roughage ($P < 0.01$) and for treatments fed GH ($P = 0.01$), but gain:feed was greater with 8.5% roughage ($P < 0.01$) and tended to be greater for SCB ($P = 0.07$). Observed net energy concentrations were greater for 8.5% roughage ($P < 0.01$) and for SCB ($P = 0.04$). For the metabolism study, 8 ruminally cannulated Nellore steers (396 ± 1.4 kg) were assigned to 2 simultaneous 4 × 4 Latin Squares. Digestibility of crude protein was greater for steers fed 8.5% roughage compared to those fed 12.5% ($P = 0.01$), and supplementing EFE tended to increase digestibility of acid detergent fiber ($P = 0.10$). Volatile fatty acid concentration was lower ($P = 0.04$) and intake time tended to be

greater (P = 0.07) with 12.5% dietary roughage compared to 8.5%. Supplementing EFE to feedlot cattle fed diets containing either SCB or GH, and either 8.5 or 12.5% roughage yielded no improvements in animal performance, but led to minor changes in digestibility and ruminal parameters.

Table 1.

	Treatment[2]									*P*-value						
Item[1]	B 8.5 Con	B 8.5 Enz	B 12.5 Con	B 12.5 Enz	H 8.5 Con	H 8.5 Enz	H 12.5 Con	H 12.5 Enz	SEM	Level	Source	Enzyme	L*S	L*E	S*E	L*S*E
Feedlot performance																
Initial BW, kg	371	371	371	371	372	370	371	371	18.72	0.68	0.50	0.14	0.89	0.89	0.22	0.14
Final BW, kg	535	533	542	541	543	535	537	534	20.19	0.53	0.98	0.25	0.07	0.66	0.56	0.73
DMI, kg	9.91	9.68	10.51	10.66	10.30	10.28	10.80	10.62	0.28	<0.001	0.01	0.57	0.13	0.65	0.79	0.26
ADG, kg	1.726	1.700	1.799	1.789	1.806	1.742	1.748	1.721	0.05	0.52	0.97	0.33	0.07	0.69	0.67	0.87
G:F	0.175	0.176	0.172	0.168	0.176	0.170	0.162	0.163	0.005	0.005	0.07	0.46	0.39	0.87	0.84	0.35
Carcass characteristics																
HCW, kg	308	307	313	307	312	307	307	309	11.56	0.75	1.00	0.28	0.27	0.94	0.62	0.17
Dressing percentage	57.52	57.62	57.81	56.85	57.39	57.43	57.21	57.85	0.38	0.81	0.93	0.85	0.47	0.64	0.13	0.10
LMA, cm²	63.77	63.84	63.04	63.54	64.20	64.80	61.92	65.16	1.69	0.53	0.69	0.35	0.85	0.52	0.49	0.64
BFT, mm	3.55	3.69	3.96	3.74	4.04	3.74	3.75	4.04	0.24	0.43	0.28	0.88	0.46	0.71	0.89	0.11

[1] Vista PreT; ABVista, Marlborough, Wiltshire, United Kingdom.

[2] B = sugarcane bagasse; H = grass hay; 8.5 = 8.5% of roughage inclusion; 12.5 = 12.5% of roughage inclusion; Con = control (no fibrolytic enzyme addition); Enz = addition of fibrolytic enzyme.

[3] BW = body weight; DMI =dry matter intake; ADG = average daily gain; G:F = feed efficiency; HCW = hot carcass weight; LMA = Longissimus muscle area; BFT = back fat thickness.

Table 2.

	Treatment[2]									*P*-value						
Item[3]	B 8.5 Con	B 8.5 Enz	B 12.5 Con	B 12.5 Enz	H 8.5 Con	H 8.5 Enz	H 12.5 Con	H 12.5 Enz	SEM	Level	Source	Enzyme	L*S	L*E	S*E	L*S*E
Observed NE[4], Mcal/kg																
Maintenance	2.08	2.09	2.03	2.00	2.07	2.02	1.95	1.95	0.04	0.001	0.04	0.50	0.54	0.93	0.84	0.27
Gain	1.41	1.42	1.37	1.34	1.41	1.36	1.30	1.30	0.04	0.001	0.04	0.50	0.54	0.93	0.84	0.27
Observed:expected NE[5] ratio																
Maintenance	1.12	1.13	1.13	1.11	1.09	1.06	1.05	1.05	0.02	0.34	<0.001	0.52	0.36	0.95	0.80	0.26
Gain	1.15	1.17	1.18	1.15	1.12	1.08	1.06	1.07	0.03	0.44	<0.001	0.52	0.21	0.96	0.80	0.26

[1] Vista PreT; ABVista, Marlborough, Wiltshire, United Kingdom.

[2] B = sugarcane bagasse; H = grass hay; 8.5 = 8.5% of roughage inclusion; 12.5 = 12.5% of roughage inclusion; Con = control (no fibrolytic enzyme addition); Enz = addition of fibrolytic enzyme.

[3] NE = net energy.

[4] Calculated according to Zinn and Shen (1998).

[5] The expected net energy for maintenance and for gain were estimated with the equations proposed by NASCEM (2016) with addition of ionophore from the sum of TDN values from each ingredient calculated using NRC (2001) according to the equations described by Weiss et al. (1992).

Table 3.

	Treatment[2]									*P*-value						
Item[3]	B 8,5 Con	B 8,5 Enz	B 12,5 Con	B 12,5 Enz	H 8,5 Con	H 8,5 Enz	H 12,5 Con	H 12,5 Enz	SEM	Level	Source	Enzyme	L*S	L*E	S*E	L*S*E
Initial BW, kg	399	398	403	398	395	392	390	396	1.36	-	-	-	-	-	-	-
DMI, kg	7.80	7.16	7.71	7.28	8.34	8.09	8.56	8.08	0.71	0.86	0.37	0.18	0.89	0.99	0.80	0.73
Fecal excretion, kg	2.39	2.12	2.45	2.28	2.68	2.39	2.90	2.41	0.29	0.15	0.47	<.001	0.94	0.77	0.27	0.34
Apparent digestibility																
DM, %	69.76	70.82	68.29	68.67	68.59	71.79	66.19	70.66	2.46	0.20	0.98	0.11	0.98	0.91	0.25	0.71
NDF, %	67.78	68.43	62.95	66.15	64.21	71.32	62.72	64.92	4.12	0.13	0.90	0.18	0.93	0.80	0.56	0.43
ADF, %	73.86	72.36	64.94	68.97	67.94	76.77	67.18	66.04	5.49	0.10	0.92	0.46	0.95	0.74	0.70	0.26
CP, %	61.79	60.87	58.22	58.30	60.89	63.26	54.58	58.86	2.68	0.01	0.89	0.32	0.43	0.61	0.20	0.87

[1] Vista PreT; ABVista, Marlborough, Wiltshire, United Kingdom.

[2] B = sugarcane bagasse; H = grass hay; 8.5 = 8.5% of roughage inclusion; 12.5 = 12.5% of roughage inclusion; Con = control (no fibrolytic enzyme addition); Enz = addition of fibrolytic enzyme.

[3] DM = dry matter; NDF = neutral detergent fiber; ADF = acid detergent fiber; CP = crude protein.

Table 4.

	Treatment[2]								*P*-value						
Item[3]	B 8,5 Con	B 8,5 Enz	B 12,5 Con	B 12,5 Enz	H 8,5 Con	H 8,5 Enz	H 12,5 Con	H 12,5 Enz	SEM	Level	Source	Enzyme	L*S	L*E	S*E	L*S*E
Ruminal pH	6.19	6.11	6.35	6.30	6.04	6.06	6.00	6.13	0.14	0.14	0.26	0.91	0.25	0.59	0.30	0.78
Total VFA, mmol/mL	81.15	90.25	79.55	75.25	96.66	91.07	92.22	85.04	7.72	0.04	0.30	0.55	0.64	0.26	0.19	0.37
VFA, mol/100mol																
Acetate	59.72	58.68	62.02	60.15	54.66	59.43	59.46	60.67	2.47	0.11	0.49	0.61	0.71	0.47	0.15	0.65
Propionate	25.00	24.95	24.90	25.40	30.55	24.30	25.76	22.56	2.92	0.30	0.82	0.13	0.25	0.55	0.10	0.67
Butyrate	10.37	10.08	8.82	9.80	10.49	11.66	10.59	11.51	1.34	0.56	0.31	0.40	0.59	0.75	0.67	0.64
Isobutyrate	1.07	0.99	1.07	1.13	0.84	0.90	0.76	1.00	0.09	0.44	0.06	0.17	0.59	0.14	0.12	0.87
Isovalerate	2.43	3.58	1.99	2.22	1.70	2.16	1.66	2.71	0.44	0.15	0.31	0.001	0.01	0.70	0.87	0.09
Valerate	1.42	1.71	1.20	1.33	1.77	1.54	1.76	1.55	0.27	0.29	0.42	0.98	0.27	0.78	0.12	0.74
Acetate:propionate ratio	2.47	2.49	2.61	2.49	2.16	2.60	2.60	2.81	0.34	0.20	0.94	0.37	0.40	0.56	0.22	0.89
Ruminal NH_3-N, mg/dL	11.62	12.89	10.87	11.41	16.30	18.20	15.70	17.45	1.95	0.45	0.005	0.25	0.85	0.85	0.70	0.90

[1] Vista PreT; ABVista, Marlborough, Wiltshire, United Kingdom.

[2] B = sugarcane bagasse; H = grass hay; 8.5 = 8.5% of roughage inclusion; 12.5 = 12.5% of roughage inclusion; Con = control (no fibrolytic enzyme addition); Enz = addition of fibrolytic enzyme.

[3] VFA = volatile fatty acids; NH_3-N = ammonia nitrogen.

Table 5.

	Treatment[2]								*P*-value						
Item[3]	B 8,5 Con	B 8,5 Enz	B 12,5 Con	B 12,5 Enz	H 8,5 Con	H 8,5 Enz	H 12,5 Con	H 12,5 Enz	SEM	Level	Source	Enzyme	L*S	L*E	S*E	L*S*E
Intake time	183.75	170.00	193.75	186.25	192.50	208.75	220.00	223.75	15.80	0.07	0.12	0.97	0.64	0.86	0.25	0.59
Chewing time	545.00	438.75	531.25	556.25	521.25	520.00	515.00	537.50	40.52	0.22	0.90	0.51	0.31	0.10	0.27	0.25
Ruminating time	361.25	268.75	337.50	370.00	328.75	311.25	295.00	313.75	37.96	0.51	0.63	0.41	0.14	0.04	0.39	0.22
Resting time	895.00	1001.25	908.75	883.75	918.75	920.00	918.75	902.50	40.67	0.19	0.87	0.47	0.35	0.12	0.30	0.22

[1] Vista PreT; ABVista, Marlborough, Wiltshire, United Kingdom.

[2] B = sugarcane bagasse; H = grass hay; 8.5 = 8.5% of roughage inclusion; 12.5 = 12.5% of roughage inclusion; Con = control (no fibrolytic enzyme addition); Enz = addition of fibrolytic enzyme

Issue Section: Ruminant Nutrition

This content is only available as a PDF.

Email address / Username

Password

Sign In

Forgot password?

Don't have an account?

American Society of Animal Science members

AMERICAN SOCIETY OF **ANIMAL SCIENCE**

Sign in via society site

Sign in via your Institution

Sign in

Purchase

Subscription prices and ordering

Rental

Read this now at deepdyve

This article is also available for rental through DeepDyve.

View Metrics

ain Content

Related articles in

Google Scholar

Citing articles via

Google Scholar

Crossref

Latest | **Most Read** | **Most Cited**

Effect of anti-inflammatory compounds or antibiotic administration on receiving performance and physiological responses of transported heifers

The welfare and productivity of sows and piglets in group lactation from 7, 10 or 14 days postpartum

January 2020 Infographic

Board invited review: Biology, strategies, and fresh meat consequences of manipulating the fatty acid composition of meat

Dietary phytonutrients and animal health: regulation of immune function during gastrointestinal infections

Skip to Main Content

About Journal of Animal Science
Editorial Board
Facebook
Twitter
Purchase

Recommend to Your Librarian
Advertising and Corporate Services
Journals Career Network

Journal of
ANIMAL SCIENCE

Online ISSN 1525-3163
Print ISSN 0021-8812

About Us
Contact Us
Careers
Help
Access & Purchase
Rights & Permissions
Open Access

Connect
Join Our Mailing List
OUPblog
Twitter
Facebook
YouTube
Tumblr

Resources
Authors
Librarians
Societies
Sponsors & Advertisers
Press & Media
Agents

Explore
Shop OUP Academic
Oxford Dictionaries
Oxford Index
Epigeum
OUP Worldwide
University of Oxford