1-30-2022

Evaluation of Dietary Roughage Inclusion in a Single or Two-Diet System for Backgrounding and Finishing

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Beef Day 2022

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Objective

The objective of this experiment was to determine the influence that equal cumulative roughage inclusion in a single diet or two-diet system during a 210-d growing-finishing period has on growth performance responses, efficiency of dietary net energy (NE) utilization, and carcass traits in beef steers.

Study Description

Pre-conditioned crossbred beef steers (n = 46; initial shrunk [4%] BW = 621 ± 89.1 lbs) were used in a 210-d grow-finish experiment at the Ruminant Nutrition Center (RNC) in Brookings, SD. Steers were fed once daily, and bunks were managed according to a slick bunk management system. Cattle were fed in 25 × 25 ft concrete surface pens (n = 10 pens; 5 pens/treatment) with 25 linear ft of bunk space and heated, concrete, continuous flow waterers. Treatments included: 1) A single-diet program (targeted a 59 Mcal/cwt NEg diet fed for 210-d; 1D) or 2) two-diet program (targeted a 55 Mcal/cwt NEg diet fed for 98-d, a 59 Mcal/cwt NEg diet fed for 14-d, and a 63 Mcal/cwt NEg diet fed for 98-d; 2D). All steers were implanted initially (d 1) with a 100 mg trenbolone acetate (TBA) and 14 mg estradiol benzoate (EB) implant (Synovex Choice) and re-implanted with a 200 mg TBA and 28 mg EB implant on d 112.

Take Home Points

- Northern Plains feedlot producers can feed a single growing-finishing diet to preconditioned beef steers with minimal effects on overall growth performance or carcass traits.
- Feed out management of ensiled feeds, could be improved and wastage reduced, especially in summer months, by feeding a single growing-finishing diet to beef steers.

Introduction

Cattle feeders in the Northern Plains routinely feed pre-conditioned feeder cattle two distinct diets during production: one diet during the backgrounding phase (forage-based) and one diet type during the finishing phase (concentrate-based) of production. Backgrounding cattle is often done as an effort to market a low-cash value feed resource through the cattle to prepare them for the finishing phase of production. Overall goals of backgrounding programs include: 1) managing disease and health, 2) achieving economical gains, 3) enhancing finishing phase feed conversion, 4) achieving maximal total carcass weight gain, and 5) managing feeder cattle supply into the feedlot phase or production.

Experimental Procedures

Growth Performance and Carcass Trait Determination

All steers were weighed individually approximately every 28-d. Ingredients were analyzed weekly for dry matter (DM) content and composited monthly for nutrient analysis. All interim period growth performance data was calculated from body weight (BW) reduced 4% to account for digestive tract fill (Table 1). Cumulative growth

performance was calculated using initial BW (average BW from d -1 and 1 shrunk 4%) and final BW (shrunk 4%). Average daily gain (ADG) was calculated as the difference between FBW and initial shrunk BW, divided by days on feed; feed efficiency was calculated from ADG/DMI. Steers were harvested after 210-d on feed; steers were shipped the afternoon following final BW determination and harvested the next day. Hot carcass weight (HCW) was captured immediately following harvest. Video image data were obtained from the packing plant for rib eye area, rib fat, and USDA marbling scores.

Results and Discussion

Growth Performance

Average daily gain tended (P = 0.06) to be 9.5% greater for 1D compared to 2D during the backgrounding phase and ADG was increased (P = 0.01) for 2D compared to 1D by 11.3% during the finishing phase of the experiment. Cumulative ADG did not differ between treatments (3.55 vs. 3.57 ± 0.10 lbs) for 1D and 2D, respectively. Observed dietary NE was calculated from daily energy gain (EG; Mcal/d): $EG = ADG^{1.097} \times 0.0557W^{0.75}$, where W is the mean equivalent BW [average initial shrunk BW and FBW × (478/AFBW), kg; (NRC, 1996)]. Maintenance energy required (EM; Mcal/d) was calculated by the following equation: $EM = 0.077BW^{0.75}$ (Lofgreen and Garrett, 1968) where BW is the mean shrunk BW (average of initial shrunk BW and FBW). Using the estimates required for maintenance and gain Cumulative observed dietary NEm and NEg did not differ (P ≥ 0.96) between treatments.

Carcass Traits

There were no differences (P ≥ 0.18) detected between treatments for HCW, dressing percentage (DP), rib eye area (REA), rib fat (RF), USDA marbling score, KPH, yield grade, retail yield, empty body fat (EBF), or body weight at 28% estimated EBF. No differences (P ≥ 0.14) were noted between dietary treatments for liver abscess prevalence or severity.

Statistical Analysis

Growth performance, carcass traits, and efficiency of dietary NE utilization were analyzed as a randomized complete block design using the GLIMMIX procedure of SAS 9.4 (SAS Inst. Inc., Cary, NC) with pen as the experimental unit. The model included the fixed effect of dietary treatment; block (weight grouping) was included as a random variable. Least squares means were generated using the LSMEANS statement of SAS and treatment effects were analyzed using the pairwise comparisons PDIFF and LINES option of SAS 9.4. Distribution of USDA Yield and Quality grade data as well as liver abscess prevalence and severity were analyzed as binomial proportions in the GLIMMIX procedure of SAS 9.4 with fixed and random effects in the model as described previously. An α of 0.05 or less determined significance and tendencies are discussed between 0.05 and 0.10.

Implications

Northern Plains feedlot producers can feed a single growing-finishing diet to preconditioned beef steers with minimal effects on overall growth performance or carcass traits. Observed responses for growth performance were as anticipated for varying levels of roughage fed during growing vs. finishing production phases. Additionally, feed out management of ensiled feeds could be improved, and wastage reduced, especially in summer months, by feeding a single growing-finishing diet to beef steers with no influence on growth performance or carcass traits.

Acknowledgements

The author wishes to acknowledge the staff of the South Dakota State University Ruminant Nutrition Center for the daily care and management for the cattle used in present study. This research was sponsored in part by the Beef Nutrition Program and the National Institute of Food and Agriculture and the South Dakota State University Experiment Station (HATCH-SD00H690-19).

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Tables

Table 1. Growing, Finishing, and cumulative growth performance responses.[a]

Item	1D	2D	SEM	*P* – value
Steers, n	23	23	-	-
Pens, n	5	5	-	-
Live weight, lbs				
Initial	615	615	3.1	0.93
112-d	1016	981	13.7	0.06
210-d	1363	1367	21.2	0.87
Average daily gain (ADG), lbs				
1-112 d	3.58	3.27	0.117	0.06
113-210 d	3.54	3.94	0.093	0.01
1-210 d	3.56	3.58	0.101	0.86
Dry matter intake (DMI), lbs				
1-112 d	20.62	20.58	0.334	0.91
113-210 d	23.79	23.77	0.606	0.97
1-210 d	22.10	22.07	0.342	0.93
ADG/DMI				
1-112 d	0.174	0.159	0.0054	0.05
113-210 d	0.149	0.166	0.0020	0.01
1-210 d	0.161	0.162	0.0027	0.76
DMI/ADG				
1-112 d	5.75	6.29	-	-
113-210 d	6.71	6.02	-	-
1-210 d	6.21	6.17	-	-
Dietary NEm, Mcal/cwt				
1-112 d	82.16	76.88	1.246	0.01
113-210 d	91.73	96.37	2.389	0.09
1-210 d	87.18	87.23	1.156	0.96
Dietary NEg, Mcal/cwt				
1-112 d	53.46	48.83	1.093	0.01
113-210 d	61.84	65.92	2.095	0.09
1-210 d	57.86	57.91	1.013	0.96
Observed-to-expected NEm				
1-112 d	0.91	0.88	0.014	0.09
113-210 d	1.00	1.00	0.025	0.88
1-210 d	0.96	0.96	0.012	1.00
Observed-to-expected NEg				
1-112 d	0.89	0.86	0.020	0.14
113-210 d	1.00	1.01	0.034	0.82
1-210 d	0.95	0.95	0.017	0.91

[a] All BW were reduced 4% to account for digestive tract fill.