South Dakota State University
Department of Animal Science

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Feedlot

Effects of bedding application on growth performance and carcass traits in finishing beef steers during the winter and spring in eastern South Dakota

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Objective

Evaluate the effects of bedding application on growth performance and carcass traits of finishing beef steers fed during the winter and spring in eastern South Dakota.

Study Description

Two-hundred and forty Continental × English beef steers (allotment BW = 805 lbs [SD 49.6]) were used in a randomized complete block design feedlot study to evaluate the effects of bedding application during the finishing phase. Cattle were received in January 2019 and steers were allotted to 30 concrete surface pens (78 ft^2/steer; n = 8 steers/pen) at the Ruminant Nutrition Center (RNC) in Brookings, SD. Pens were assigned to 1 of 2 treatments: 1) No bedding applied (**NO**) or 2) 4.0 lb (as-is basis) of wheat straw bedding/steer/d (**BED**). Pen was the experimental unit; an α of 0.05 determined significance. Bedding was applied as was deemed necessary by the feedlot manager depending on pen conditions. The goal of bedding application was to maintain a dry, bedded area large enough for all 8 steers to lay down in BED pens at all times during the study. The first 9 pen replicates began on test 14 d prior to the last 6 pen replicates. The non-bedded cattle remained on test for an additional 35 days to achieve similar compositional endpoint.

Take home points

Bedding cattle resulted in improved ($P \leq 0.01$) dry matter intake, average daily gain, and feed conversion. Additionally, not bedding cattle resulted in a greater increase ($P = 0.01$) in estimated metabolic rate. These data suggest that bedding application improves feedlot finishing phase growth performance and gain efficiency throughout the finishing phase during winter and spring months in eastern South Dakota.

Keywords: bedding, cattle growth performance, cold stress

Effects of bedding application on growth performance and carcass traits in finishing beef steers during the winter and spring in eastern South Dakota

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Abstract

A feedlot finishing study was conducted to evaluate the effects of bedding application on growth performance and carcass traits of beef steers fed during the winter and spring in eastern South Dakota. Two hundred and forty Continental x English beef steers (allotment BW = 805 lbs [SD 49.6]) were used in a randomized complete block design feedlot study and pens were assigned to 1 of 2 treatments: 1) no bedding applied (**NO**), or 2) 4.0 lbs (as-is basis) of wheat straw bedding/steer/d (**BED**). This study was part of a factorial experiment including steroidal implants; no significant interactions were observed ($P \geq 0.09$). Daily ambient temperature (n = 183) averaged 39.8°F [SD 26.2] during the study. Applying bedding improved ($P \leq 0.01$) dry matter intake (DMI), feed:gain (F:G), and average daily gain (ADG). Bedding cattle also reduced ($P = 0.01$) the estimated metabolic rate during the entirety of the trial. These data suggest that use of bedding improved estimated metabolic rate, growth performance, and feed efficiency during the finishing phase in eastern South Dakota during winter and spring.

Introduction

Feeding cattle in the upper Midwest can pose a unique set of environmental challenges. Persistent cold temperatures coupled with snow accumulation, wind, and ice can contribute to undesirable pen conditions for cattle. Temperatures falling below the lower critical temperature for cattle with a dry, heavy winter coat (18°F) may result in an increase in the net energy required for maintenance and due to this, a decrease in feed available for gain. Tracking systems currently used to predict cattle performance rely on two specific requirements of the beef animal, net energy required for maintenance and net energy for gain (Lofgreen and Garrett, 1968). Previous work has been done related to effects of bedding application (Anderson, 2006; Birkelo, 1992) on beef cattle, however, performance results have been variable. Understanding the impact of bedding relative to the net energy required for maintenance (NEm) during winter months could prove valuable to the feedlot manager by allowing for more accurate tracking and performance prediction.

Experimental Procedures

Two-hundred and forty Continental × English beef steers (allotment BW = 805 lbs [SD 49.6]) were used in a randomized complete block design feedlot study to evaluate the effects of bedding application during the finishing phase. Cattle were received in January 2019 and steers were allotted to 30 concrete surface pens (78 ft^2/steer; n = 8 steers/pen) at the Ruminant Nutrition Center (RNC) in Brookings, SD. Initial processing included weighing, ear tagging, and rectal temperature measurement along with vaccination for bovine respiratory syncytial virus (BRSV), bovine rhinotracheitis (IBR), bovine viral diarrhea (BVD) Types 1 and 2, parainfluenza 3 (PI3), Mannheimia haemolytica (pasteurella), and clostridium perfringens type A. Cattle were re-vaccinated 36 days after initial processing for clostridium perfringens type A and were poured with a paraciticide. Pens were assigned to 1 of 2 treatments: 1) No bedding applied (**NO**) or 2) 4.0 lb (as-is basis) of wheat straw bedding/steer/d (**BED**). Bedding was applied as was

deemed necessary by the feedlot manager depending on pen conditions. The goal of bedding application was to maintain a dry, bedded area large enough for all 8 steers to lay down in BED pens at all times during the study. The first 9 pen replicates began on test 14 d prior to the last 6 pen replicates. The non-bedded cattle remained on feed for an additional 35 days to achieve similar compositional endpoint.

A common diet consisting of dry-rolled corn, dried distillers grains, and oatlage or grass hay was fed that contained 14.2% crude protein, 95.1 Mcal/cwt of NEm, and 63.7 Mcal/cwt of NEg. A liquid supplement was provided to add 30 g/ton of monensin sodium to diet DM along with supplemental vitamins and minerals to meet NASEM (2016) requirements.

Upon arrival cattle were stepped up from a 50% to 90% concentrate diet. All steers were fed 2X daily at 0800h and 1400h; bunks were managed according to slick bunk management approach. All pens were on the final high-concentrate diet by d 18. When necessary, orts were collected, weighed and dried in a forced air oven at 212°F for 24 h to determine DM content if carryover feed went out of condition, or was present on weigh days. If carryover feed was present on weigh days, the residual feed was removed prior to the collection of BW measurements. The DMI of each pen was adjusted to reflect the total DM delivered to each pen after subtracting the quantity of dry orts for each interim period. Feedstuff samples were taken weekly and analyzed for DM, CP, NDF, ADF, and ash using AOAC procedures.

Cattle from BED and NO were on fed 143 and 178 d respectively prior to being harvested at a commercial abattoir when the population reached sufficient fat cover to grade USDA Choice. Carcass data including ribeye area, hot carcass weight, 12th rib BF, kidney, pelvic, and heart fat percent, and USDA marbling score were collected by trained personnel. Yield grade was calculated by using the USDA regression equation (USDA, 1997).

Data were analyzed using the GLIMMIX procedure of SAS 9.4 (SAS Inst. Inc., Cary, NC). The study was analyzed as a randomized complete block design and fixed effects included in the model were bedding and block. Pen served as experimental unit; an α of 0.05 determined significance.

Results and Discussion

Daily ambient temperature during the 183-day study averaged 39.8°F [SD 26.2]. Carcass-adjusted final BW tended to differ (P = 0.07) between NO and BED. Dry matter intake was increased (P = 0.01) by 5.8% in BED compared to NO (Table 1). Carcass-adjusted ADG was increased (P = 0.01) and F:G was decreased (P = 0.01) in BED by 21.0% and 14.4%, respectively. Estimated metabolic rate was elevated (P = 0.01; 108.85 vs. 97.79 ± 1.008 kcal/$BW^{0.75}$, kg), for NO vs. BED. Hot carcass weight tended to differ (P = 0.07) between NO and BED. Dressing percentage (P = 0.01; 63.29 vs. 62.30 ± 0.140%), backfat (P = 0.01; 0.47 vs. 0.43 ± 0.008 in), marbling (P = 0.01; 475 vs. 437 ± 6.6), and yield grade (P = 0.03; 2.95 vs. 2.81 ± 0.045) were increased in NO. Retail yield was increased (P = 0.01) for BED compared to NO. Rib eye area (P = 0.69) did not differ between NO and BED. Cattle from NO required an additional 35 days to achieve similar final live BW.

Implications

Bedding cattle resulted in improved dry matter intake, average daily gain, and feed conversion. Additionally, not bedding cattle resulted in a greater increase in estimated metabolic rate. These data suggest that bedding application improves feedlot finishing phase growth performance and gain efficiency throughout the finishing phase during winter and spring months in eastern South Dakota.

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Table 1. Effect of bedding on cattle performance and carcass characteristics[1]

Item	NO	BED	SEM	*P*-values
Pens	15	15	-	-
DOF	178	143	-	-
Initial BW, lb	805	805	0.9	0.95
Cx adjusted BW, lb	1267	1255	4.5	0.07
DMI, lb	20.5	21.7	0.27	0.01
Cx ADG, lb/d	2.61	3.16	0.042	0.01
Cx F:G	7.89	6.88	0.104	0.01
Maintenance Coefficient, kcal/$W^{0.75}$	108.85	97.79	1.008	0.01
Dress, %	63.29	62.30	0.140	0.01
HCW, lbs	792	784	2.8	0.07
REA, in^2	12.89	12.82	0.117	0.69
BF, in	0.47	0.43	0.008	0.01
Marbling	475	437	6.6	0.01
EBF, %	28.95	28.29	0.140	0.01
YG	2.95	2.81	0.045	0.03
RY, %	50.53	50.92	0.100	0.01

[1]Treatments: No bedding applied = (NO), 4.0 lbs (as-is basis) of wheat straw bedding/steer/d = (BED).
BW = Body weight, Cx = Carcass, DMI = Dry matter intake, EBF = Empty body fat, F:G = Feed to gain ratio, HCW = Hot carcass weight, REA = Ribeye area, YG = Yield grade, RY = Retail yield