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Effects of Backgrounding and Feedlot System Strategies on May-Born Steer Performance

Alicia C. Lansford

Jacki A. Musgrave
University of Nebraska–Lincoln, jacki.musgrave@unl.edu

T. L. Meyer
tl.meyer@live.com

Rick N. Funston
University of Nebraska–Lincoln, rick.funston@unl.edu

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Summary with Implications

May-born steers were backgrounded to achieve either a high or low rate of gain. The high rate of gain was achieved by offering steers meadow hay ad libitum and 4 lb/d of a 33% CP (DM) supplement, while the low rate of gain consisted of steers grazing meadow and offered 1 lb/d of the same supplement. After backgrounding, one-half of the steers from each group entered the feedlot in May as short-yearlings, while the remainder grazed upland range until entering the feedlot as long-yearlings in mid-September. Hot carcass weight was greater for steers backgrounded to achieve a high rate of gain, but they also consumed more during the feedlot phase and had fewer carcasses grade USDA average Choice or greater compared with steers backgrounded to achieve a low rate of gain. Long-yearling steers had increased marbling scores and percentage of carcasses grading USDA average Choice or greater compared with short-yearling steers. Furthermore, long-yearlings had increased carcass weight and risk for overweight carcasses.

Introduction

Historically, May-born calves wean at a lighter BW than March-born calves (*2018 Nebraska Beef Cattle Report*, pp. 15–17 and 21–23). Therefore, producers calving in May could increase calf BW before feedlot entry with overwinter backgrounding. Traditional backgrounding focuses on increased BW gain; however, mild nutrient restriction during backgrounding, followed by realimentation in the feedlot may alter metabolic function and increase energy utilization. Steers restricted during backgrounding typically undergo compensatory growth in the feedlot and reach a common fat thickness with fewer days on feed compared with unrestricted steers. May-born heifers developed on a low rate of gain overwinter exhibit compensatory gain when moved to a high-quality forage (*2018 Nebraska Beef Cattle Report*, pp. 24–27). Furthermore, using a low-cost, high-quality forage during the summer months to increase May steer BW before feedlot entry may optimize calf growth and forage resources. The objective of this study was to evaluate 2 backgrounding systems and 2 feedlot systems on May-born steer growth and carcass characteristics.

Procedure

A 6-yr study was conducted at the Gudmundsen Sandhills Laboratory (GSL), Whitman, and West Central Research and Extension Center (WCREC), North Platte, to examine how differing backgrounding systems and feeding systems affect May-born steers.

Backgrounding System

At weaning in January, May-born steers at GSL were blocked by wean BW and assigned randomly to 1 of 2 backgrounding systems until approximately May 8. Steers assigned to a high-input system (HI; n = 194, 428 ± 9 lb) were offered meadow hay ad libitum and 4 lb/d of a 33% CP supplement (DM, Table 1). The remaining steers were assigned to a low-input system (LO; n = 198, 437 ± 9 lb) and grazed sub-irrigated meadow and were offered 1 lb/d of the same supplement.

Feedlot System

At the conclusion of the backgrounding period in May, one-half of the steers from each backgrounding system were transported to WCREC and placed in a feedlot for 212 d (S-YRL; n = 195, 551 ± 4 lb).

Table 1. Nutrient analysis of supplement[1] provided to steers during backgrounding phase[1]

Item	
Nutrient	
CP, % (DM)	32.9
RUP, % CP	39.7
TDN, % (DM)	78.4
Ingredient, % DM	
Dried distillers grains meal	52.5
Soybean meal (46.5% CP)	14.7
Vitamin and mineral package[2]	13.3
Wheat middlings	6.3
Sunflower meal (35% CP)	6.3
Molasses, liquid	3.7
Urea	1.6
Cull Beans	1.5

[1]At January weaning, steers were blocked by BW and assigned to 1 of 2 development treatments until May 8: HI = each steer offered meadow hay ad libitum plus 4 lb/d supplement cube, LO = each steer grazed dormant subirrigated meadow plus 1 lb/d of the same supplement.

[2]Supplement formulated to provide 0.7 g/lb Monensin (Rumensin, Elanco Animal Health, Indianapolis, IN).

Steers in the S-YRL system were implanted with Synovex Choice at feedlot entry. The remaining steers (L-YRL; n = 197, 765 ± 4 lb) were implanted with Revalor G and grazed upland range at GSL. The L-YRL steers were transported to the WCREC feedlot approximately Sept. 14, implanted with Ralgro at feedlot entry, and remained in the feedlot for 171 d.

Both S-YRL and L-YRL steers were adapted to a common feedlot diet over 21 d consisting of 48% dry rolled corn, 40% wet corn gluten feed, 7% prairie hay, and 5% supplement (DM basis). The supplement included vitamins, minerals, monensin (1.3 g/lb; Rumensin, Elanco Animal Health, Indianapolis, IN), and tylosin (1.0 g/lb; Tylan 40, Elanco Animal Health). Steers were reimplanted with Synovex Plus 110 d after feedlot entry for S-YRL steers and 70 d for L-YRL steers. Hot carcass weight (HCW) was recorded at slaughter and carcass data collected following a 24-h carcass chill.

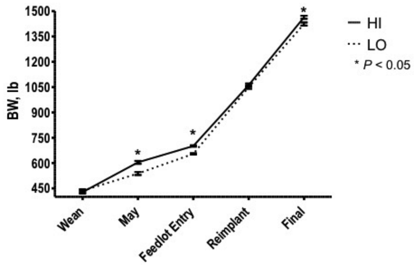

Figure 1. The effects of backgrounding treatment on May-born steer BW. At weaning in January, steers were blocked by BW and assigned to 1 of 2 development treatments until May 8: HI steers were offered meadow hay ad libitum plus 4 lb/d 33% CP (DM) cube, while LO steers grazed subirrigated meadow plus 1 lb/d of the same supplement.

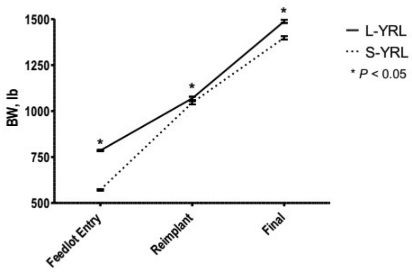

Figure 2. The effects of feedlot system on May-born steer BW. S-YRL steers entered the feedlot at an average day of May 8, immediately following backgrounding treatment and remained in the feedlot for 212 d. L-YRL steers grazed summer range following backgrounding treatment and entered the feedlot for 171 d at an average date of Sept. 14.

Table 2. Effect of backgrounding treatment[1] on May-born steer ADG, DMI, F:G, and RFI values

	HI	LO	SEM	TRT
Background ADG, lb[2]	1.41	0.77	0.07	< 0.01
Feedlot ADG, lb	4.10	4.03	0.04	0.30
DMI, lb/d	27.8	27.1	0.2	0.03
DMI, % BW	2.6	2.6	0.02	0.45
F:G, lb:lb	7.0	6.8	0.2	0.06
RFI[3]	0.027	-0.047	0.073	0.47

[1]At January weaning, steers were blocked by BW and assigned to 1 of 2 development treatments until May 8: HI = each steer offered meadow hay ad libitum plus 4 lb/d 33% CP (DM) supplement cube, LO = each steer grazed dormant subirrigated meadow plus 1 lb/d of the same supplement.

[2] Background ADG = January 8 weaning to an average date of May 8.

[3]RFI = residual feed intake where RFI = Actual DMI–[group average DMI + [b_m × (individual mid-test $BW^{0.75}$–group average mid-test $BW^{0.75}$ + [b_g × (individual ADG–group average ADG)] where b_m is the slope coefficient for mid-test BW and b_g is the slope coefficient for ADG when regressed against DMI.

Final BW was calculated by adjusting HCW to a common dressing percentage of 63%. Percentage of empty body fat (EBF) was calculated using EBF = 17.76107+(1.84308 × FT)+(0.04288 × HCW)+(0.81855 × QG)-(0.02659 × LMA); where FT = 12^{th} rib fat thickness (in), HCW = hot carcass weight (lb), QG = quality grade (4 = Select, 5 = Choice–, 6 = $Choice^0$, 7 = Choice $^+$, 8 = Prime), and LMA = *longisimuss* muscle area (in^2).

GrowSafe Feeding System

Feedlot intake data was unavailable for steers in the first year of the study. In yr 2 to 6, a GrowSafe feeding system (GrowSafe Systems Ltd., Airdrie, AB, Canada) was acquired and steers were placed in the system upon feedlot entry. No intake data were included from the initial 2 wk adaptation period or on the day of shipping. Recorded daily intakes from the GrowSafe system were used to calculate DMI, G:F, and residual feed intake (RFI). Residual feed intake was considered as the actual DMI minus predicted DMI. Predicted DMI was calculated using the following equation. Predicted DMI = Group avg. DMI + [b_m × (Indiv. $midBW^{0.75}$ – Group avg. $midBW^{0.75}$)] + [b_g × (Indiv. ADG – Group avg. ADG)] where $midBW^{0.75}$ = mid-test metabolic BW and was predicted using the equation: Feedlot entry BW + [ADG × (Total days in feedlot ÷ 2)]. Any daily DMI values above or below 4 standard deviations from the group mean for system within yr were considered outliers and excluded from the data.

Statistical Analysis

All data were analyzed using the PROC GLIMMIX procedure of SAS (SAS Inst. Inc., Cary, NC, version 9.4). The experimental unit was considered as treatment × year, where treatment was either backgrounding system or feedlot system. The model statement included the fixed effects of background treatment, feedlot system, and the resulting interaction. No significant interactions were detected between backgrounding treatment and feedlot system, so main effects are reported. Year was included as a covariate in all analyses and was removed when $P > 0.05$. Data were considered significant at $P \leq 0.05$ and a tendency if $P \leq 0.10$ and $P > 0.05$.

Results

Backgrounding System (HI vs LO)

The effects of backgrounding treatment on steer BW are presented in Figure 1. Initial BW was similar ($P = 0.50$) between treatments. Steers assigned to the HI system had a greater ($P < 0.01$) May BW, feedlot entry BW, and final BW, but had a similar ($P = 0.24$) reimplant BW. Corresponding with their increased May BW, HI steers had a greater ($P < 0.01$) backgrounding average daily gain (ADG, Table 2).

Steer ADG and feedlot measurements are presented in Table 2. There were no differences ($P = 0.30$) in ADG over the entire feeding period. Steers assigned to the LO treatment tended ($P = 0.06$) to have decreased F:G ratios, which is a result of LO steers having decreased ($P = 0.03$) feedlot DMI, but similar ($P = 0.30$) ADG. Dry matter intake as a percentage of BW was similar ($P = 0.45$) between treatments. Furthermore, RFI values were also similar ($P = 0.47$) between treatments.

The effects of backgrounding system on steer carcass characteristics is presented in Table 3. Hot carcass weight (HCW) was heavier ($P < 0.01$) for HI steers due to increased final BW. Percent EBF, 12^{th} rib fat, and LM area were similar ($P \geq 0.13$) between treatments. Likewise, yield grade was also similar ($P = 0.73$) between treatments. Steers assigned to the LO backgrounding system tended ($P = 0.10$) to have increased marbling scores, which

Table 3. Effect of backgrounding treatment[1] on May-born steer carcass characteristics

	HI	LO	SEM	*P*–value
HCW, lb	922	897	7	< 0.01
EBF, %[2]	35.1	35.1	0.2	0.96
Marbling score[3]	468	482	6	0.10
12th rib fat, in	0.59	0.59	0.02	0.83
LM area, in²	14.8	14.6	0.1	0.13
Yield grade	3.3	3.2	0.1	0.73
Choice⁻ or greater, %	82	87	3	0.19
Choice⁰ or greater, %	21	29	4	0.09
Carcass size				
% ≥ 1,000 lb	17	10	3	0.03
% ≥ 1,050 lb	5	2	2	0.04

[1]At January weaning, steers were blocked by BW and assigned to 1 of 2 development treatments until May 8: HI = each steer offered meadow hay ad libitum plus 4 lb/d 33% CP (DM) supplement cube, LO = each steer grazed subirrigated meadow plus 1 lb/d of the same supplement.

[2] EBF = empty body fat where EBF = 17.76107 + (1.84308 × FT) + (0.04288 × HCW) + (0.81855 × QG)–(0.02659 × LMA), where FT = 12th rib fat thickness (in), HCW = hot carcass weight (lb), QG = quality grade (4 = Select, 5 = Choice–6 = Choice, 7 = Choice +, 8 = Prime), LMA = LM area (in²).

[3] 300 = slight^{00}, 350 = slight^{50}, 400 = small^{00}, 450 = small^{50}, 500 = modest^{00}.

Table 4. Effect of feedlot system[1] on May-born steer ADG, DMI, F:G, and RFI values

	L-YRL	S-YRL	SEM	TRT
Feedlot ADG, lb	4.14	4.01	0.04	0.05
DMI, lb/d	28.9	26.0	0.2	< 0.01
DMI, % BW	2.5	2.7	0.02	< 0.01
F:G, lb:lb	7.1	6.6	0.2	< 0.01
RFI[4]	0.011	-0.031	0.074	0.68

[1]Feedlot system: S-YRL = steers entering feedlot at an average date of May 8 and fed for 212 d, L-YRL = steers entering feedlot at an average date of Sept. 14 and fed for 171 d.

[3]RFI = residual feed intake where RFI = Actual DMI–[group average DMI + [b_m × (individual mid-test $BW^{0.75}$–group average mid-test $BW^{0.75}$ + [b_g × (individual ADG–group average ADG)] where b_m is the slope coefficient for mid-test BW and b_g is the slope coefficient for ADG when regressed against DMI.

Table 5. Effect of feedlot system[1] on May-born steer carcass characteristics

	L-YRL	S-YRL	SEM	*P*–value
HCW, lb	937	882	7	< 0.01
EBF, %[2]	35.6	34.7	0.02	< 0.01
Marbling score[3]	491	459	6	< 0.01
12th rib fat, in	0.63	0.59	0.02	0.31
LM area, in²	14.8	14.5	0.1	0.02
Yield grade	3.3	3.2	0.1	0.04
Choice⁻ or greater, %	87	81	3	0.10
Choice⁰ or greater, %	32	19	4	< 0.01
Carcass size				
% ≥ 1,000 lb	25	6	3	< 0.01
% ≥ 1,050 lb	8	1	2	< 0.01

[1]Feedlot system: S-YRL = steers entering feedlot at an average date of May 8 and remained in the feedlot for 212 d, L-YRL = steers entering feedlot at an average date of Sept. 14 and remained in the feedlot for 171 d.

[2] EBF = empty body fat where EBF = 17.76107 + (1.84308 × FT) + (0.04288 × HCW) + (0.81855 × QG)–(0.02659 × LMA), where FT = 12th rib fat thickness (in), HCW = hot carcass weight (lb), QG = quality grade (4 = Select, 5 = Choice⁻, 6 = Choice, 7 = Choice⁺, 8 = Prime), LMA = LM area (in²).

[3] 300 = slight^{00}, 350 = slight^{50}, 400 = small^{00}, 450 = small^{50}, 500 = modest^{00}.

resulted in a tendency (*P* = 0.09) for more LO steers to grade USDA average Choice or greater. Furthermore, LO steers had fewer (*P* ≤ 0.04) carcasses weighing greater than 1,000 lb.

Feedlot System (S-YRL vs L-YRL)

Steers assigned to the L-YRL system had a greater (*P* ≤ 0.03) BW at all time points (Figure 2). Steer feedlot performance is presented in Table 4. Steers in the L-YRL system had increased (*P* ≤ 0.05) total ADG. Dry matter intake was greater (*P* < 0.01) for L-YRL steers, but L-YRL had a decreased (*P* < 0.01) DMI as a percentage of BW. Steers in the S-YRL system had decreased (*P* < 0.01) F:G ratios, but no differences were detected (*P* = 0.68) in RFI between treatments.

Carcass characteristics of steers in each feedlot system is presented in Table 5. Corresponding with an increased final BW, HCW was greater (*P* < 0.01) for L-YRL steers, which may have resulted in an increased (*P* < 0.01) percentage of L-YRL steers with 1,000 lb carcasses. Percent EBF was increased (*P* < 0.01) for L-YRL steers, although there were no differences (*P* = 0.31) in 12th rib fat thickness. Additionally, L-YRL steers had a greater (*P* ≤ 0.04) LM area and yield grade. Marbling score was increased (*P* < 0.01) for L-YRL steers. This may have caused a tendency (*P* = 0.10) for a greater percentage of L-YRL steers to grade USDA low Choice or greater, and for a greater (*P* < 0.01) percentage of L-YRL steers grading USDA average Choice or greater.

Conclusions

Steers backgrounded on the LO system weighed less at the conclusion of the backgrounding and feedlot phases; however, these steers consumed less feed in the feedlot and had decreased F:G ratios. Furthermore, LO steers tended to have a greater percentage of carcasses grading USDA average Choice or greater, and fewer overweight carcasses compared with HI steers. Steers in a L-YRL feedlot system weighed more at slaughter and consumed less feed per lb of BW, although they had increased F:G ratios. At slaughter, L-YRL steers produced heavier carcasses, which resulted in more overweight carcasses. Additionally, L-YRL steers had increased marbling scores and an increased percentage of steers grading USDA average Choice or greater. Use of a low-input backgrounding system may increase May-born steer profitability in the feedlot phase. Furthermore, grazing of May-born steers on a low-cost forage prior to feedlot entry may result in more valuable carcasses, although the risk for overweight carcasses is increased.

Alicia C. Lansford, graduate student

Jacki Musgrave, research technician

T.L. Meyer, research technician

Rick N. Funston, professor, West Central Research and Extension Center, North Platte, NE