2017

Effect of Backgrounding System on Steer Performance and Carcass Characteristics

Jordan L. Cox
University of Nebraska-Lincoln, jcox7@huskers.unl.edu

Kristin E. Hales
University of Nebraska-Lincoln, kristin.hales@ars.usda.gov

Kristen M. Ulmer Ulmer
University of Nebraska-Lincoln, kristen.ulmer@unl.edu

Richard J. Rasby
University of Nebraska - Lincoln, rrasby1@unl.edu

Steven D. Shackleford
University of Nebraska-Lincoln, steven.shackelford@ars.usda.gov

See next page for additional authors

Effect of Backgrounding System on Steer Performance and Carcass Characteristics

Jordan L. Cox
Kristin E. Hales
Kristen M. Ulmer
Rick J. Rasby
Steven D. Shackleford
Chad Engle
John Rieckman
Harvey C. Freetly
Mary E. Drewnoski

Summary with Implications

The impact of 3 backgrounding systems: grazing corn residue with distillers grains supplementation at 0.86% BW/d, grazing an oats-brassica forage, or feeding a grower ration in a drylot on finishing performance and carcass characteristics were evaluated. Backgrounding phase gains were greatest for steers fed a grower ration in the drylot (3.58 lb/d), intermediate for steers grazing oats-brassica forage and then fed the grower ration for short period (2.65 lb/d), and least for steers grazing corn residue while supplemented distillers grains and then fed the grower ration for short period (2.22 lb/d). These backgrounding treatment differences did not affect ADG during the finishing period (3.73 lb/d). However, the 2 grazing treatments had greater DMI resulting in poorer F:G. Overall, these backgrounding systems did not affect carcass quality. Increased finishing phase cost for the 2 grazing treatments due to poorer F:G, can be offset by less input cost during backgrounding, but ultimately the cost effectiveness is dependent on the production resources and scenarios of each individual producer.

Introduction

In Nebraska there is significant opportunity to background spring born calves in the winter using forages produced from crop acres, including crop residues and double-cropped annual forages (cover crops). Therefore it is important to understand how backgrounding systems affect subsequent finishing performance and carcass characteristics. Research has suggested greater rates of gain during the backgrounding phase typically reduce finishing ADG. However, data regarding subsequent finishing performance and carcass characteristics of short yearlings grazing fall double-cropped forages, such as late summer planted oats and brassicas (turnips and radishes) are not available. Therefore, the objective of this study was to evaluate the subsequent finishing performance and carcass characteristics of backgrounding spring born calves by 1) grazing corn residue and feeding a distillers grains based supplement at 0.86% BW/d, 2) grazing an oats, turnip, radish mix double-crop planted after corn silage harvest, or 3) drylotting calves on a corn silage based grower ration.

Procedure

This experiment was conducted at the Meat Animal Research Center near Clay Center, Neb., utilizing 355 spring-born, MARC II composite steer calves. Calves receiving a grower ration were stratified by BW (610 ± 61 lb) and genetic line, and then assigned to 1 of 3 treatments: 1) corn residue grazing with distillers supplementation (CRD), 2) oat-brassica forage grazing (OBF) or 3) consuming a grower ration in the drylot (DGR). Each treatment had 4 replicates. On November 20, 2014, calves were sorted to their assigned group and were started on their treatment.

Calves in the DGR treatment were placed in 4 feedlot pens with 30 calves per pen. They were backgrounded on the grower ration (Table 1) for 54 d. Weight at the start for finishing was targeted to be 800 lb for all treatments. Thus an intermediate weight of DGR calves was taken prior to feeding on d 25 and used to calculate ADG to predict when the target weight of 800 lbs would be achieved.

Calves on CRD were placed in an irrigated corn field that was divided into 4 quarters with 31 acres and 30 calves per quarter. The corn yield from this field averaged 225 bu/ac. Calves were supplemented 6 d a week with 6.1 lb DM/steer/d of dried distillers grains mixed with limestone at 2% on DM basis. Calves on OBF were placed in an irrigated field planted after corn silage. The forage in the double-cropped field consisted of 55% oats, 15% radish, and 30% purple top turnips (DM basis). This field was divided into 4, 31-acre quarters. Each quarter was stocked at a rate of 3,617 ± 21 lb DM/steer and there were 25, 30, 30, and 30 calves per quarter. Double-cropped forage samples were taken on Nov. 6, Dec. 9, and Jan. 13, with the average nutritive value being 22.9% CP and 67.4% TDN [calcu-

Table 1. Composition of grower and finishing ration

Ingredient	Grower Ration DM basis, %	Finishing Ration DM basis, %
Dry Rolled Corn	—	55.8
Corn Silage	51.0	8.7
Alfalfa Hay	25.0	—
WDGS[1]	20.0	32.3
Supplement[2]	4.0	3.2
Analyzed composition		
NEm, Mcal/lb	0.75	2.15
NEg, Mcal/lb	0.47	1.48

[1]Wet distillers grains plus solubles.
[2]Supplement provided Rumensin at 28 g/ton of diet DM.

Table 2. Finishing performance of calves backgrounded by grazing corn residue and supplemented with dry distillers grains at 0.86% of BW (CRD), grazing a fall oats and brassica forage (OBF), or fed a grower ration in drylot (DGR).

	CRD	OBF	DGR	SEM[4]	*P*-value
Finishing Period[1]					
Starting BW, lb	805[b]	840[a]	805[b]	5.3	<0.01
Final Live BW[2], lb	1338[b]	1376[a]	1349[ab]	9.3	0.05
Final BW[3], lb	1358[b]	1404[a]	1367[b]	9.3	0.01
DMI, lb/d	22.3[a]	22.7[a]	20.9[b]	0.35	0.02
ADG[3], lb	3.47	3.54	3.53	0.062	0.68
F:G[3]	6.45[a]	6.41[a]	5.99[b]	0.055	<0.01

[a,b,c]Means within a row lacking a common superscript differ.
[1]All treatments were in the finishing phase for 160 d.
[2]Final live BW taken prior to feeding the morning before hauling to the packing plant, with a calculated 4% shrink.
[3]Carcass adjusted Final BW, ADG, and F:G using a common dressing percent of 63%.
[4]Standard error of the least squares mean.

Table 3. Carcass characteristics of calves backgrounded by grazing corn residue and supplemented with dry distillers grains at 0.86% of BW (CRD), grazing a fall oats and brassica forage (OBF), or fed a grower ration in drylot (DGR).

	CRD	OBF	DGR	SEM[2]	*P*-value
HCW, lb	858[b]	886[a]	862[b]	6.0	0.01
12th rib fat, in	0.58	0.61	0.61	0.019	0.62
LM area, in^2	13.2	13.2	12.8	0.11	0.06
Calculated YG	3.29[b]	3.48[a]	3.49[a]	0.047	0.02
Marbling	402	419	423	5.6	0.06
% Choice	44	59	56	4.1	0.06

[ab]Means lacking common letters are different
[1]Marbling Score: 400 = Slight[00], 450 = Slight[50], 500 = Small[00]
[2] Standard error of the least squares mean.

lated using the equation: TDN = 98.625-(ADF%*1.048)]. The CRD and OBF calves were removed from grazing after 64 d when the OBF biomass was thought to be limiting intake (1,287 ± 93 lb DM/ac; about 3 inches of growth remaining) and moved to the feedlot. Calves were maintained in their previous groups when placed into feedlot pens. Calves were weighed at entry to the feedlot, fed the grower ration for 6 days and prior to feeding on the 7th day weighed again. To allow the CRD and OBF calves to reach the 800 lb target BW before starting the finishing diet, CRD and OBF calves were fed the grower ration (Table 1) an additional 14 d (d 86 of trial) and a single weight was taken prior to feeding and then calves were transitioned to a finishing diet.

All treatments were provided Rumensin either by a free choice mineral for the two grazing treatments or a supplement in the grower ration. Performance during the background phase was reported previously (2016 Nebraska Beef Cattle Report, pp. 55–57). Backgrounding gains were greatest for DGR at 3.58 lb/d, intermediate for OBF at 2.65 lb/d (grazing plus grower ration), and least for CRD at 2.22 lb/d (grazing plus grower ration).

All calves were implanted with Revalor®-XS (Merck Animal Health) at the start of finishing and fed a common finishing diet (Table 1) for 160 d. Final weights were taken prior to feeding the morning before steers were hauled to the packing plant. Steers were not limit fed due to all calves consuming the same finishing ration for an adequate amount of time that gut fill stasis should have been met. Hot carcass weight, 12th rib back fat, LM area, marbling score, yield grade, and quality grade data was collected when calves were harvested.

A partial budget analysis was conducted to evaluate the costs of each backgrounding system. The feed cost in the budget included: distillers supplementation ($129/ton), and corn residue cost ($0.20/hd/d) for CRD calves, seed plus seeding costs ($38.90/ac or $41.58/hd), and N fertilizer ($27.36/ac or $29.25/hd) for OBF calves as well as costs of the grower ration ($114/ton DM) for all treatments. During the backgrounding period CRD and OBF calves were charged $0.10/d for yardage (fence and water maintenance) and CRD calves were charged an additional $0.10/d for the extra labor to feed their supplement. The yardage cost for feed calves in the feedlot was charged at $0.40/d. The finishing ration was $140.72/ton DM for all treatments.

Results

Finishing Performance

Body weight at the start of the finishing phase was greatest ($P < 0.01$) for steers grazing oats-brassica forage (840 lb) due to greater gains in the backgrounding phase than CRD calves and more days in the growing phase than DGR calves (Table 2). Body weight at the start of finishing was not different ($P = 0.92$) between DGR and CRD (805 lb). There was no difference in carcass adjusted ADG among the 3 treatments during finishing, resulting in the initial finishing BW ranking to be maintained throughout finishing. Dry matter intake did not differ ($P = 0.40$) between OBF (22.7 lb/d) and CRD (22.3 lb/d) calves, but were greater ($P = 0.02$) than calves placed directly in the drylot (20.9 lb/d). With the ADG similar among treatments, this 1.6 lb/d difference in DMI caused the calves in the grazing treatments (OBF and CRD) to have poorer ($P < 0.01$) F:G than DGR steers.

Carcass Characteristics

Calves on OBF had greater ($P = 0.01$) HCW (886 lb) than DGR (862 lb) and CRD (858 lb), which were similar ($P = 0.51$) (Table 3). This is due to the OBF steers having 30 lb more BW when entering the finishing phase.

Twelfth rib fat was not different ($P = 0.62$) among the treatments, with an average 12th rib fat of 0.60 inch. Marbling score tended ($P = 0.06$) to differ among treatments, with DGR (423) and OBF (419) not differing ($P = 0.59$), but DGR being greater ($P = 0.02$) than CRD (402) while OBF tended ($P = 0.06$) to be greater than CRD.

Table 4. Partial budget economic analysis[1] of three backgrounding systems: grazing corn residue plus supplemented with dry distillers at 0.86% of BW (CRD), grazing a fall oats and brassica forage (OBF) or fed a grower ration in drylot (DGR).

	CRD	OBF	DGR	SEM[6]	*P*-value
Growing period					
Grazing period					
Feed cost[2,3], $/hd	22.97	71.89	—	—	—
Yardage[4], $/hd	12.10	6.50	—	—	—
Drylot period					
Feed cost[5], $/hd	22.70	23.45	56.06	—	—
Yardage[4], $/hd	8.40	8.40	21.60	—	—
Total cost, $/hd	66.17	110.24	77.66	—	—
Cost of gain, $/lb	0.34[c]	0.48[a]	0.41[b]	0.011	<0.01
Finishing period					
Feed cost[5], $/hd	251.52	255.18	237.46	—	—
Yardage[4], $/hd	64.00	64.00	64.00	—	—
Total cost, $/hd	315.52	319.18	301.46	—	—
Cost of gain, $/lb	0.570[a]	0.565[a]	0.535[b]	0.0053	<0.01
Overall					
Total cost, $/hd	380.42	428.15	381.19	—	—
Cost of gain, $/lb	0.510[b]	0.540[a]	0.503[b]	0.0043	<0.01

[1]Excludes vet cost, interest and transportation.
[2]Distillers supplement $110/ton and corn residue $0.20/hd/d.
[3]Seed plus seeding $38.90/ac ($41.58/hd) and N fertilizer $27.36/ac ($29.25/hd).
[4]Yardage: drylot $0.40/d; feeding supplement $0.10/d and checking fence, water and calves while grazing $0.10/d.
[5]Grower ration $114/ton DM and Finishing ration $141/ton DM; Corn at $3.62/bu, Corn Silage at 10% the price of corn, Alfalfa hay at $97/ton, WDGS (85% DM) at 75% the price of corn, and Supplement at $250/ton.
[6]Standard error of the least squares mean.

The differences observed in marbling score are most likely explained by the numerical differences in 12th rib fat (i.e. degree of finish). Research has indicated that a 0.039 inch change in 12th rib fat will result in a 30 unit change in marbling score and a 12 percentage unit change in percent choice (2000 Nebraska Beef Cattle Report, pp. 20-22). Calves on the DGR treatment had a 0.028 inch more back fat than CRD calves. Therefore, we would predict a 20 unit greater marbling score for DGR than for CRD, which is similar to the 21 unit difference observed between these 2 treatments.

The LM area tended ($P = 0.06$) to differ among treatments, with OBF and CRD not differing ($P = 0.87$) but were greater ($P \leq 0.05$) than DGR. Calculated yield grade of OBF (3.48) and DGR (3.49) did not differ ($P = 0.88$) but were slightly greater ($P \leq 0.0.1$) than CRD (3.29). However, yield grade differences were extremely small and did not result in a difference in discounts or premiums.

Economics

A partial budget comparison of the treatments can be found in Table 4. These comparisons do not include veterinary costs, interest, or transportation. During the growing period the cost of gain for CRD was the lowest at $0.34/lb ($P < 0.01$), while the cost of gain for DGR calves was intermediate ($0.41/lb), and OBF had the greatest cost of gain ($0.48/lb). There are some scenarios such as when manure will be fall applied to provide nutrients for the next cash crop (and thus will be a source of N for the oat-brassica forage) or when seed cost is offset by payments from conservation stewardship programs, which alter the backgrounding costs of OBF and make this system competitive with the CRD steers during the growing phase. More details pertaining to these scenarios are presented in the 2016 Beef Report (2016 Nebraska Beef Cattle Report, pp 55–57).

During the finishing phase, the 2 grazing treatments had a greater ($P < 0.01$) cost of gain (OBF: $0.57/lb and CRD: $0.57/lb) than DGR ($0.54/lb). This difference is due to the greater DMI of grazing treatments and lack of difference in ADG during the finishing period. The overall cost of gain from weaning to slaughter was greatest ($P < 0.01$) for OBF steers ($0.54/lb) followed by CRD ($0.51/lb) and DGR ($0.50/lb), which were not different ($P = 0.25$). The lower cost of gain during the growing period for CRD calves did help offset the increased finishing cost due to DMI during the finishing period. Opportunity for reduced total cost of gains could have been achieved for the CRD steers if the winter grazing period had of been extended.

Conclusions

Utilizing corn residue with distiller supplementation or oats-brassica forages during the winter for backgrounding calves will not significantly impact gains or carcass characteristics during the subsequent finishing phase. However, increased DMI during the finishing phase could increase finishing input cost for the 2 grazing treatments over calves fed a corn silage-based ration during the backgrounding period. These increased finishing phase costs were offset by the lower growing cost of the calves grazing corn residue in this study. Ultimately, the cost effectiveness depends on the production resources and scenarios of each individual producer.

Jordan L. Cox, graduate student, Animal Science, Lincoln

Kristin K. Hales, Scientists Meat Animal Research Center, Clay Center, NE

Kristen M. Ulmer, graduate student, Animal Science, Lincoln

Rick J. Rasby, professor, Animal Science, Lincoln

Steven D. Shackleford, Scientists Meat Animal Research Center, Clay Center, NE

Chad Engle, Meat Animal Research Center, Clay Center, NE

John Rieckman, Meat Animal Research Center, Clay Center, NE

Harvey C. Freetly, Scientists Meat Animal Research Center, Clay Center, NE

Mary E. Drewnoski, assistant professor, Animal Science, Lincoln