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Effects of Wintering System on Cow and Calf Performance in a Summer-Calving Intensive Production System

Jason M. Warner
University of Nebraska-Lincoln

Curtis J. Bittner
University of Nebraska-Lincoln, curtis.bittner@unl.edu

Robert G. Bondurant Bondurant
University of Nebraska-Lincoln, robby.bondurant@unl.edu

Karla H. Jenkins
University of Nebraska-Lincoln, kjenkins2@unl.edu

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

See next page for additional authors

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Summary

Effects of wintering cow-calf pairs on cornstalks or in a drylot on cow-calf performance and reproduction in a summer-calving intensively managed cowherd were evaluated at two locations. Cow body condition score change was not different between treatments in western Nebraska, but was greater for pairs fed in a drylot in eastern Nebraska. In western Nebraska, calf gain and weights were not different between treatments, but were greater for drylot calves in eastern Nebraska. Initial data indicate that wintering pairs on cornstalks may decrease cow performance and calf gain. If reproduction is adequate and grazing is not impeded, wintering pairs on cornstalks may be viable for later-calving cowherds compared to drylot feeding.

Introduction

Data from previous studies (*2015 Nebraska Beef Cattle Report*, pp. 14–15 & 16–18) indicate that intensive management (confinement) of cowherds may be a viable alternative when forage resources for grazing are limited. Cornstalk residues represent a valuable forage resource for fall/winter grazing and may complement an intensive cow-calf production system because areas with fewer traditional forage resources also tend to favor grain crop production. Results from economic analyses of alternative cow-calf systems suggest that incorporating cornstalk grazing may decrease production costs (*2015 Nebraska Beef Cattle Report*, pp. 19–21). Gestating spring-calving cows maintain BW and BCS when grazing cornstalk residue (*Professional Animal Scientist*, 27:540–546), yet few data are available regarding a lactating female and her calf when grazing the same forage resource. Our objectives were to test a winter management system incorporating winter cornstalk grazing on cow-calf performance in a summer-calving intensively managed cow-calf production system.

Procedure

Multiparous (5.1 ± 1.4 yr old), crossbred (Red Angus × Red Poll × Tarentaise × South Devon × Devon), lactating beef cows (n = 65) with summer-born calves at side were used in an experiment conducted at both the University of Nebraska–Lincoln Agricultural Research and Development Center (ARDC) feedlot located near Mead, Neb., and the Panhandle Research and Extension Center (PHREC) feedlot at Scottsbluff, Neb. The trial was a randomized complete block design with two treatments. Cow—calf pairs within each location (n = 36 and 29 pairs at ARDC and PHREC, respectively) were blocked by cow BW (4 blocks at ARDC, 2 blocks at PHREC), stratified by calf age, and assigned randomly within strata to one of two wintering system treatments with either four (ARDC) or two (PHREC) replications (pens or paddocks) per treatment (4–8 pairs per replicate). Treatments included: 1) drylot feeding (DL) or cornstalk residue grazing (CS).

Preceding the initiation of the experiment, cows at their respective locations were managed as a single group during the summer calving season (mean calving date = July 13 and 14 at ARDC and PHREC, respectively). Post-calving, cows were limit-fed distillers grains and crop residue-based diets to meet nutrient requirements for early-lactation. At trial initiation (Nov. 6 at ARDC; Dec. 1 at PHREC) cow-calf pairs assigned to the CS treatment were transported to irrigated cornstalk fields for winter grazing. Cows and calves assigned to the DL treatment remained in drylot pens and were limit-fed a diet (Table 1) formulated to meet maintenance energy requirements for a lactating cow in early-gestation. The amount of feed offered to DL pairs increased monthly throughout the experiment to account for growth and increasing diet consumption by the calf. Within a location, all calves regardless of wintering system were weaned on a common date. At ARDC, calves were removed from their dams April 13, and this date

Table 1. Ingredient and nutrient composition of diets fed to cow-calf pairs in drylot by location[a]

	Location	
Ingredient, %	ARDC	PHREC
Modified wet distillers grains plus solubles	55.0	—
Wet distillers grains plus solubles	—	58.0
Wheat straw	40.0	40.0
Supplement[b]	5.0	2.0
Calculated Composition		
DM, %	62.4	47.0
CP, %	19.3	18.8
TDN, %	79.1	81.0
NDF, %	54.0	54.9
ADF, %	31.0	21.6
Ca, %	0.79	0.77
P, %	0.52	0.49

[a]All values presented on a DM basis.
[b]Supplements included limestone, trace minerals, and vitamin A,D,E premix.

corresponded to the end of the cornstalk grazing period. At PHREC, calves were separated from cows April 2.

Stocking rate for CS pairs was determined based on corn grain yield with an assumption of 8 lb (DM) of leaf and husk available for consumption per bushel of grain yield (*2012 Nebraska Beef Cattle Report*, pp. 11–12) and estimated residue intakes by the cow and calf (*2009 Nebraska Beef Cattle Report*, pp. 13–14). At ARDC, pairs grazed a field which has been in a corn/soybean rotation for multiple years and also has three treatments applied annually: un-grazed, fall-grazed, and spring-grazed. Consequently, cows and calves grazed four paddocks initially from November through February, and were rotated to four additional paddocks to graze from March through mid-April. Pairs at PHREC grazed fields that have been in a corn/sugar beets/dry-edible beans rotation and cattle were moved to a new field in mid-Feb. Pairs at both locations were supplemented (5.2 lb DM/pair/d, range of 3.5 to 7.0 lb) with a dried distillers grains based pellet (Table 2). The supplementation rate was designed to provide an equivalent energy intake to that of the DL pairs, based on estimated residue intakes by the cow and calf (*2009 Nebraska Beef Cattle Report*, pp. 13–14) and digestibility values throughout the grazing period (*2004 Nebraska Beef Cattle Report*, pp. 13–15). The supplement was fed daily in bunks with approximately 2 feet of linear space per pair. Hay was not fed during the cornstalk grazing period except when snow impeded grazing.

Cow BW measurements were recorded over two consecutive d at trial initiation and completion to determine cow weight change throughout the winter. Body condition score was visually assessed by the same experienced technician concurrent with collecting weights. Calf BW measurements were also recorded during two consecutive d to determine gain during the winter period. Before collecting weights at trial initiation, all pairs were limit-fed for five d to minimize variation in gastrointestinal tract fill. Upon trial completion, all calves were removed from their dams, and cows and calves were limit-fed separately for a minimum of five d prior to recording weights.

Cows were exposed to Simmental × Angus bulls at a bull:cow ratio of approximately 1:10 beginning Sept. 24. The breeding season was 86 and 61 d at ARDC and PHREC, respectively. Therefore, at ARDC, the first one half of the breeding season occurred while cows were in drylot pens and the second half occurred while cows were on cornstalks. At PHREC, cows were managed in drylot pens during the entire breeding season. All bulls passed a breeding soundness examination administered by a licensed veterinarian. Cows were rectally palpated approximately 135 d after bull removal to determine pregnancy status.

Data were analyzed as a randomized complete block design with pen or paddock as the experimental unit. Because of the large difference in cornstalk grazing d, the data for ARDC and PHREC were analyzed separately. The fixed effect of wintering system was included in all analyses. As the proportion of steer and heifer calves was unequal among treatments, calf sex was initially included as a covariate for all variables tested and was ultimately removed if not significant. Block was included in all analyses as a random effect, and significance was declared at $P \leq 0.05$.

Results

At ARDC, the cornstalk grazing period was Nov. 6 to April 13 (158 d). Hay was only fed during one wk when snow prevented grazing (approx. 32 lb DM/pair/d). The corn yield at ARDC was 245 bu per acre, and assuming 15.3 lb (DM) of total leaf and husk produced per bu of grain yield, then cattle removed approximately 40.5% of available residue. At PHREC, the grazing period began Dec. 1, but cattle were removed from the field Jan. 6 due to heavy snowfall that prevented grazing. Approximately 135 lb (DM) of grass hay was fed per pair before removal from cornstalks. When transported back to drylot pens, cows and calves were fed the same diet at an equal DMI as the DL pairs. Pairs returned to cornstalks Feb. 19 and grazed without supplemental hay until Mar. 17 for a total grazing period length of 62 d. Upon completion of the cornstalk grazing period at PHREC, pairs were moved to drylot pens and fed the same ration as the DL pairs until weaning (April 2). Corn grain yields for the two fields at PHREC were 216 and 190 bu per acre, thus cattle removed an estimated 11.7% of available residue. The differences in weather conditions and subsequent grazing d observed between locations in our study demonstrate the variability that can exist in Nebraska. Clearly, the availability of cornstalk residue for grazing is affected by winter weather which may pose a risk to a cow-calf production system that is dependent on its use.

Table 2. Supplement fed to cow-calf pairs on cornstalks[a, b, c]

Ingredient, %	
Dried distillers grains plus solubles	94.51
Limestone	3.50
Pelleting binder (urea formaldehyde polymer and calcium sulfate)	1.88
Vitamin A,D,E	0.11

[a]All values presented on a DM basis.
[b]Fed at 5.2 lb per pair per d (DM).
[c]Trace mineral supplement top-dressed at time of feeding.

Pairs assigned to the DL wintering treatment were limit-fed 27.6 ± 0.5 (ARDC) or 27.3 ± 0.2 (PHREC) lb DM/pair daily on average throughout the experiment, and this amount increased monthly to account for increasing intake by the calf. At ARDC, DL cows had greater ending BW than cows that grazed cornstalks, but treatments were not different at PHREC (Table 3). However, at both locations DL cows gained more BW than cows that grazed cornstalks. Cow BCS responded in similar fashion to BW. Ending BCS was not different between CS or DL cows at PHREC, but was greater for DL than CS cows at ARDC. Cows that grazed cornstalks at ARDC lost 1.0 BCS unit, while DL cows gained 0.5 units.

Calves at ARDC were approximately 25 d younger than those at PHREC at the start of the cornstalk grazing period (Table 4). Ending calf BW was not different between treatments in western Nebraska, but was greater for DL than CS calves at ARDC. Calf gain was not different between DL and CS treatments at PHREC, while DL calves outgained those that grazed cornstalk residue in eastern Nebraska. Likewise, BW per d of age was not different between treatments at PHREC, but was greater for DL than CS calves at ARDC.

The inconsistent responses between treatments can likely be explained by the variable weather conditions observed across locations which influenced cornstalk grazing d. Any significant performance differences may not be expected between CS and DL pairs at PHREC, given the grazing period was relatively short (62 d).

Table 3. Performance of cows by location and wintering system

	ARDC[a]				PHREC[b]			
Item	CS[c]	DL[d]	SEM	*P*-value	CS[c]	DL[d]	SEM	*P*-value
Cow BW, lb								
Initial	1222	1217	80	0.83	1257	1247	137	0.69
Ending	1125	1339	64	0.03	1271	1307	145	0.34
Cow BW change, lb	-97	122	28	< 0.01	14	61	8	0.03
Cow BCS[e]								
Initial	5.6	5.6	0.4	0.88	5.3	5.3	0.5	0.87
Ending	4.6	6.0	0.2	< 0.01	5.2	5.4	0.6	0.63
Cow BCS change[e]	-1.0	0.5	0.2	< 0.01	-0.1	0.2	0.1	0.34

[a]ARDC = Agricultural Research and Development Center.
[b]PHREC = Panhandle Research and Extension Center.
[c]CS = pairs wintered on cornstalks.
[d]DL = pairs wintered in drylot.
[e]BCS on a 1 (emaciated) to 9 (obese) scale.

Table 4. Performance of calves by location and wintering system

	ARDC[a]				PHREC[b]			
Item	CS[c]	DL[d]	SEM	*P*-value	CS[c]	DL[d]	SEM	*P*-value
Initial age, d[e]	111	118	—	—	139	140	—	—
Ending age, d[f]	278	285	—	—	267	268	—	—
Calf BW, lb								
Initial	319	320	9	0.93	306	312	22	0.27
Ending	558	672	19	0.02	525	512	45	0.57
Calf ADG, lb	1.44	2.13	0.09	< 0.01	1.62	1.49	0.18	0.50
BW•d•age, lb[g]	2.01	2.36	0.07	0.04	1.96	1.91	0.16	0.64

[a]ARDC = Agricultural Research and Development Center.
[b]PHREC = Panhandle Research and Extension Center.
[c]CS = pairs wintered on cornstalks.
[d]DL = pairs wintered in drylot.
[e]Initial age = age at initiation of cornstalk grazing period.
[f]Ending age = age at collecting weights following weaning.
[g]Weight per d of age at collecting weights following weaning.

At PHREC, cows and calves were removed from corn residue fields due to snow cover after a short grazing period when digestibility of the residue was high. Improved diet quality and because pairs were fed the same diet as DL pairs after returning to pens, may have enabled cows to maintain BW and BCS. Cows that grazed cornstalks at ARDC lost BW and 1.0 BCS unit during the wintering period, while those fed a complete diet gained BW and BCS. This agrees with previous work in which lactating August-calving cows grazing cornstalks lost BW and similar amounts of body condition (*2010 Nebraska Beef Cattle Report*, pp. 5–7). The supplementation rate for CS pairs was designed to provide an equal energy intake to that of the DL pairs. Given that cows lost BW and BCS, the amount of energy provided was apparently less than originally expected. Several factors may have influenced this including an overestimation of the quality of grazed residue, residue intake, possible digestibility differences between grazed and limit-fed diets, and milk production level. These same variables may have also influenced the differences observed in BW gain between CS and DL calves at ARDC. Pregnancy rates were adequate among treatments (90–100%), but additional numbers are needed to determine real effects of wintering system on reproductive performance. Preliminary data from this ongoing study suggest that wintering summer-calving pairs on cornstalk residue as part of an intensively managed system may result in cow BW and BCS losses compared to feeding pairs in a drylot. Any negative changes in BW or BCS may be less of a hindrance on reproduction provided losses occur well after the breeding season and cows are in adequate BCS (≥ 5.0) prior to calving. Daily gains for calves wintered on cornstalks with their dams may be similar to or less than those managed in a drylot.

Jason M. Warner, graduate student

Curtis J. Bittner and Robert G. Bondurant, research technicians, Department of Animal Science, Lincoln

Karla H. Jenkins, assistant professor, Panhandle Research and Extension Center, Scottsbluff

Rick J. Rasby, professor, Department of Animal Science, Lincoln

Matt K. Luebbe, assistant professor, Panhandle Research and Extension Center, Scottsbluff

Galen E. Erickson and Terry J. Klopfenstein, professors, Department of Animal Science, Lincoln