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Effect of Post-Weaning Heifer Development System on Average Daily Gain, Reproduction, and Adaptation to Corn Residue During First Pregnancy

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Summary

A three-year study evaluated post-weaning winter grazing system management on primiparous heifers at two locations. Weaned heifers were assigned to a development system: (1) graze corn residue then winter range, (2) graze winter range, or (3) graze winter range then placed in drylot. A combination of artificial insemination (AI) and natural mating was used at time of breeding based on location. Pregnant heifers were assigned to one of three corn residue fields in late gestation based on previous heifer development. Weaned heifers developed on corn residue had similar BW and ADG during winter grazing and after breeding, compared to heifers developed on winter range. The effect of post-weaning management on reproductive performance was similar for all heifer treatments. Heifers developed on winter range or drylot had similar ADG compared to heifers developed on corn residue, during late gestation.

Introduction

Developing replacement heifers on low quality dormant forage, such as corn residue or winter range, is less expensive than feeding harvested forage. Dormant winter forage is reduced in nutrient quality, and cattle developed on dormant forage tend to have reduced performance and BW. Fernandez-Rivera and Klopfenstein (*Journal of Animal Science*, 1989, 67:590-596) determined that naïve cattle require an acclimation period for grazing corn residue (CR). Objectives of this experiment were to evaluate the effect of winter grazing system on heifer ADG and reproductive performance, and to determine the effects of winter development system on subsequent adaptation to corn residue during late gestation.

Procedure

The University of Nebraska–Lincoln (UNL) Institutional Animal Care and Use Committee approved the procedures and facilities used in this experiment.

Red Angus x Simmental composite heifer calves (n = 287) were blocked by weight (486 ± 8 lb) and randomly assigned one of two winter development systems, (1) graze CR for 75 days, followed by WR for 105 days, or (2) graze winter range (WR) continuously for approximately 180 days. Heifers assigned to CR were transported to a corn field, whereas WR heifers were maintained at the UNL Gudmundsen Sandhills Laboratory (GSL) near Whitman, Neb. Both treatment groups were offered 1 lb/day of a supplement (28% CP) during winter grazing. After winter treatment all heifers were managed similarly on WR and mixed upland pastures at GSL for 100 days prior to breeding. Estrus was synchronized with a single 5 ml injection of $PGF_{2\alpha}$ administered 108 hours after bulls were exposed to heifers. Bulls remained (1 bull to 25 heifers) with heifers for 45 days. Heifers remained on Sandhills upland range through final pregnancy diagnosis in September.

A subset of pregnant heifers (n = 148) were blocked by weight and assigned to one of three CR fields based on previous development: a naïve group composed of only WR heifers (859 ± 16 lb; n = 51), a group previously developed on CR after weaning (860 ± 16 lb; n = 50), and a mixture of the two development systems with half of the heifers having previous CR grazing experience, and the other heifers being naïve (849 ± 16 lb; n = 47) to CR grazing. All three groups were supplemented the equivalent of 1 lb/day (28% CP) three times weekly while grazing CR. Pregnant heifers grazed CR approximately 75 days, based on CR availability over three years. In addition, weaned, angus cross heifers (n = 159) from the UNL West Central Research and Extension Center (WCREC), North Platte, Neb., grazed (1) CR and WR or (2) grazed WR and then placed in a drylot (DL) during winter development. Heifers were fed MGA to synchronize estrus, followed by AI and bull exposure for 60 days. A subset of pregnant heifers were blocked by weight and assigned to one of three CR fields during mid to late gestation, based on previous winter development: DL heifers naïve to grazing CR (995 ± 19 lb; n = 53), heifers previously developed on CR (992 ± 19 lb; n = 52), and a mixture of heifers from each development system (982 ± 19 lb; n = 54). The same three CR fields were used for GSL and WCREC heifers during late gestation. Heifers grazed CR for approximately 76 days prior to calving based on CR availability. Data were analyzed using the MIXED and GLIMMIX procedures of SAS (SAS Inst., Inc., Cary, N.C.) with year being the experimental unit and development system as the fixed effect.

Results

Heifers from GSL had similar ADG and BW during post-weaning winter development (Table 1). Percent cycling before breeding and pregnancy rate was similar for WR and CR heifers ($P \geq 0.31$). Previous research

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recommended a target weight of 65% mature weight for successful breeding of beef heifers; however, more recent research has demonstrated that heifers developed to 55% of mature BW experienced successful pregnancy rates (Martin et al., *Journal of Animal Science,* 2008, 86:451-459). Thus, utilizing dormant winter forages to develop heifers may reduce BW at time of breeding without negatively affecting pregnancy rates. Heifers developed on WR had similar ADG compared to CR heifers, when grazing CR in late gestation (Table 2). Post-weaning WCREC heifer data are reported in the *2012 Beef Cattle Report*, pp. 39-40. Although not statistically significant, ADG for pregnant heifers developed on CR was increased twofold, compared to naïve heifers previously developed in DL (Table 3). Developing heifers on CR does not negatively impact reproductive efficiency when compared to WR or traditional DL heifer development. By extending winter grazing for weaned heifers, producers can reduce harvested feed inputs without impacting ADG or BW prior to first parturition.

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Table 1. Effect of winter heifer development on ADG and reproduction in beef replacement heifers.

	Treatment[1]			
	CR	WR	SEM	*P*-value
n	144	143		
Initial BW, lb	485	489	9	0.56
Dec. – Feb. ADG[2], lb	0.49	0.67	0.13	0.21
BW after winter grazing, lb	526	544	12	0.11
Prebreeding BW, lb	608	619	8	0.36
Feb. – April ADG[3], lb	1.02	0.83	0.15	0.14
Breeding BW, lb	637	643	6	0.40
April – May ADG[4], lb	1.16	1.05	0.10	0.18
Final Pregnancy BW, lb	788	796	5	0.38
June – Sept. ADG[5], lb	1.63	1.64	0.15	0.84
Cycling, %	52	46	6	0.31
Pregnant, %	85	86	2	0.80
Pregnant BCS	5.8	5.8	0.02	0.46

[1]CR = heifers developed on corn residue; WR= heifers developed on winter range.
[2]ADG while grazing CR or WR.
[3]ADG between winter development and prebreeding.
[4]ADG between prebreeding and breeding.
[5]ADG between breeding and pregnancy diagnosis.

Table 2. Effect of weaned heifer development system on ADG while grazing corn residue (CR) during late gestation.

	Treatment[1]				
	WR	CR	MIX	SEM	*P*-value
n	51	50	47		
Initial BW, lb	859	860	849	16	0.75
Final BW, lb	919	933	909	20	0.41
ADG, lb	0.80	0.94	0.78	0.22	0.41
BCS	5.1	5.3	5.2	0.10	0.24

[1]WR = heifers grazed winter range that were naïve to grazing CR; CR = heifers who had previously grazed corn residue; MIX = mixture of heifers from CR and WR treatments.

Table 3. Effect of weaned heifer development system on ADG while grazing corn residue (CR) during late gestation.

	Treatment[1]				
	DL	CR	MIX	SEM	*P*-value
n	53	52	54		
Initial BW, lb	975	964	980	19	0.81
Final BW, lb	995	1004	1004	30	0.94
ADG, lb	0.26	0.53	0.26	0.33	0.42

[1]DL = heifers developed in drylot that were naïve to grazing CR; CR = heifers who had previously grazed corn residue; MIX = mixture of heifers from CR and DL.

