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2017

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Tibbitts, Benjamin T.; Nielson, Hazy Rae; Ramsay, K. H. Ramsay; and Funston, Richard N., "Growth and Reproductive Performance of Yearling Beef Heifers Implanted with Revalor G in the Nebraska Sandhills" (2017). *Nebraska Beef Cattle Reports*. 1005.
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Growth and Reproductive Performance of Yearling Beef Heifers Implanted with Revalor G in the Nebraska Sandhills

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Summary with Implications

This study evaluated effects of a single stocker implant (Revalor G) on growth and reproductive performance of yearling beef heifers in the Nebraska Sandhills. Crossbred heifers, grazing native Sandhills range, were randomly assigned to either be implanted 82 ± 2 days prior to estrus synchronization, or not implanted, to determine the effects of growth implants on heifer performance. Heifers were bred via artificial insemination followed with clean-up bulls. Implanted heifers gained more and were heavier at the end of the trial, but had a reduced pregnancy rate than non-implanted heifers. Implanted heifers also had a lower pregnancy rate in their second breeding season. Implanting yearling beef heifers increased average daily gain; however, it decreased initial and subsequent pregnancy rate compared with heifers not implanted. When deciding to implant replacement females, the current (or expected) market conditions for pregnant and feeder heifers must be considered.

Introduction

Administering growth implants in stocker systems results in increased growth, improved efficiency, and increased profitability. Initially, growth implants were utilized in the finishing phase of production, but over the past several decades, growth implants have been incorporated at earlier stages of growth and development. Growth implants have not been widely used in heifer calves due to reproductive concerns, but suckling calf implants approved in breeding heifers have little or no effect on subsequent reproduction when implanted according to the label, which in general is from 30 to 45 d of age and prior to weaning. Since traditional heifer development programs focus on maximizing reproductive rates, reproductive risk associated with implants not intended for breeding females has been avoided.

The objective of the present study was to evaluate effects of a single stocker implant (Revalor G) on growth and reproductive performance of yearling beef heifers in the Nebraska Sandhills.

Procedure

In 2011, 12 mo old crossbred beef heifers (n = 3,242; 525 ± 4 lb) grazing native Sandhills range at 3 locations were randomly assigned to be implanted with Revalor G (40 mg trenbolone acetate and 8 mg estradiol, **IMP**) or not implanted (control, **CON**). Heifers were implanted at the beginning of the grazing period (May 1). At the time of implant, all heifers were vaccinated (Pyramid 5, Boehringer Ingelheim, St. Joseph, MO; and VL5 Staybred, Zoetis, Florham Park, NJ) and treated with a topical endectocide (Ivermax, RXV Products, Westlake, TX). At each location, heifers grazed common upland pastures for 164 ± 4 d.

Breeding season began 82 ± 2 d following trial initiation. Heifers at location 1 (**L1**, n = 942) were synchronized with 2 prostaglandin $F_{2\alpha}$ (**PG**) injections administered 17 d apart (5 ml, Lutalyse, Zoetis, Florham Park, NJ) followed by 5 d of estrus detection and AI. Mature bulls were then placed with heifers at a 1:52 bull to heifer ratio for 20 d to conclude the breeding season. At location 2 (**L2**; n = 1,184) and 3 (**L3**; n = 1,116), mature bulls were placed with heifers at a 1:82 bull to heifer ratio 6 d before heifers received a single PG injection followed by 6 d of estrus detection and AI. Estrus detection aids were utilized at all 3 locations (Estrotect, Rockway Inc., Spring Valley, WI) at PG injection. Heifers were considered to have expressed estrus when greater than 50% of the rub-off coating had been removed from the Estrotect patch and were AI 12 h later. Following the AI period, mature bulls were then placed with heifers at ratios of 1:49 and 1:35 at L2 and L3, respectively, for 19 d to conclude a 25 d breeding season.

Heifers were managed on native Sandhills range throughout the summer grazing period. Pregnancy diagnosis was conducted via transrectal palpation approximately 45 d following bull removal and ending BW measured. Non-pregnant heifers were marketed as stocker cattle. During the second production year, heifers (n = 1,667; 706 and 961, for IMP and CON, respectively) retained as replacements were managed in 3 groups and grazed native upland range throughout the year without further treatment. Cows were offered 1 lb/d of a 32% CP supplement range cube for 30 d (15 d prior to breeding until 15 d following bull turnout). Pregnancy diagnosis was performed via transrectal palpation approximately 45 d following bull removal.

Economic Evaluation

Winter grazing cost was estimated to be one-half the grazing costs for a mature cow ($0.46/d) based on heifer BW at weaning. Winter range with supplement was valued at $0.75/d. Summer grazing costs were $0.55/d for upland grass. Additional development costs, including feed delivery costs, breeding costs, and health and veterinarian costs, were charged at $0.36/head/d. Average heifer purchase and cull prices were based on USDA Agricultural Marketing Service prices reported in Nebraska for each date. The total value of cull heifers was subtracted from the total cost of all developed heifers. Total costs were then divided by the number of heifers exposed to determine the total cost of 1 pregnant heifer. This value was divided by final pregnancy rate to determine the total net cost of 1 pregnant heifer.

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Statistical Analysis

Data were analyzed using the GLIMMIX procedure of SAS. Individual heifer was the experimental unit and synchronization protocol was included as a random variable in the model. Location was experimental unit for economic analysis and in Table 2 where data are presented by location. Least squares means and SE for ADG, BW, and pregnancy rate were obtained using the Tukey function of SAS.

Results

The main effects of heifer growth and reproductive performance are presented in Table 1 and are presented by location in Table 2. Initial heifer BW was similar ($P > 0.10$) between treatments (525 ± 4 lb). Implanted heifers had greater ADG and ending BW ($P < 0.05$; 1.48 vs. 1.39 ± 0.02 lb/d and 765 vs. 750 ± 7 lb for IMP and CON, respectively). Heifers in the current study grazed native upland Sandhills pasture during the trial without supplement. Forage quality of Sandhills rangeland early in the grazing period is high, but decreases with increasing plant maturity (1997 Nebraska Beef Report, pp. 3–5). Therefore, heifers on a higher plane of nutrition for the entire grazing period would likely have a greater growth response to implants.

In a previous study (1984 Nebraska Beef Report, pp.45–47), implants were administered to crossbred beef heifers at 1, 6, or 9 mo, or at multiple intervals. Heifers receiving a combination of 2 implants had greater ADG from weaning to breeding than control or heifers implanted 3 times. Conception rates in a 62-d breeding season were comparable for implanted vs. non-implanted control heifers (93 vs. 96%), with the exception of heifers receiving implants at both 1 and 6 mo of age (56%). Calf birth weight, dystocia score, cow re-breeding rate, and calf weaning weight were not affected by implant treatment.

In the present study, pregnancy rate was greater ($P < 0.01$) for CON vs. IMP heifers (64 vs. 46 ± 3%). In the 1984 Nebraska Beef Report, pp.45–47 which observed similar conception rates among non-implanted controls and heifers implanted at 1, 6, or 9 mo of age, implants were administered earlier than in the present study. Strength and type of hormone provided by different

Table 1. Effects of Revalor-G on reproduction and summer BW gain of beef heifers grazing native Sandhills rangeland

Item	CON[1]	IMP[2]	SEM	*P*-value
n	1,621	1,621		
Spring BW, lb	522	525	4	> 0.10
Fall BW, lb	750	765	7	< 0.01
ADG[3], lb	1.39	1.48	0.02	< 0.01
Pregnancy rate, %	64	46	3	< 0.01
2nd preg. rate,[4] %	96	93	2	0.02

[1]CON = Heifers did not receive a growth implant prior to breeding season.
[2] IMP = Heifers received a Revalor G implant 82 ± 2 d prior to breeding season (Merck Animal Health, Summit, NJ).
[3] Grazing season ADG (Location 1–162 d, Location 2–160 d, Location 3–168 d).
[4]Second season pregnancy rates (n = 1,667).

Table 2. Effects of Revalor G on reproduction and summer BW gain of beef heifers grazing native Sandhills rangeland by location

Item	CON[1]			IMP[2]			SEM	*P*-value
Location	L1	L2	L3	L1	L2	L3		
Spring BW, lb	511	518	540	511	520	545	9	0.20
Fall BW, lb	719	774	791	732	794	805	33	0.02
ADG, lb[3]	1.28	1.59	1.48	1.34	1.70	1.54	0.13	0.03
Pregnancy rate, %	59	64	67	44	44	51	3	< 0.01

[1]CON = Heifers did not receive a growth implant prior to breeding season.
[2]IMP = Heifers received a Revalor G (Merck Animal Health, Summit, NJ) implant 82 ± 2 d prior to breeding season.
[3]Grazing season ADG (Location 1, 162 d; Location 2,160 d; Location 3, 168 d).

Table 3. Economics of implanting beef heifers with Revalor G at 12 mo of age[1]

Item	CON[2]	IMP[3]	SEM	*P*-value
Winter feed costs /$heifer[4]	102	102	.02	1.0
Summer feed cost /$heifer	91	91	.1	1.0
Total feed costs, $/heifer	193	193	.02	1.0
Total development cost[5] $/heifer	1,019	1,019	3	1.0
Avg. cull heifer value $	1,102	1,123	46	0.66
Cull heifer value $/heifer exposed	402	601	18	< 0.01
Net cost of 1 pregnant heifer[6], $	969	901	36	0.13

[1]Heifers developed at Rex Ranch on native Sandhills rangeland.
[2]CON = Heifers did not receive a growth implant prior to breeding season.
[3]IMP = Heifers received a Revalor G (Merck Animal Health, Summit, NJ) implant 82 ± 2 d prior to breeding season.
[4]Heifers grazed winter range for 135 d with the equivalent of 1 lb/d 32% CP supplement 3 times per wk.
[5]Includes all fixed and variable cost associated with initial heifer price, feed, feed delivery, breeding, transportation, and supplement.
[6]Total value of cull heifers was subtracted from the total cost of all developed heifers. Total costs were then divided by the number of heifers exposed to determine the total cost of 1 pregnant heifer.

implants may also contribute to variation in pregnancy rates observed between studies. Ralgro was utilized in the 1984 study, whereas Revalor G was used in the present study. Both Ralgro and Revalor G are synthetic hormones; however Ralgro contains zeranol, an estrogenic hormone that mimics estradiol, and Revalor G contains trenbolone acetate, an androgenic hormone that mimics testosterone

Subsequent pregnancy rate after the first calving season was also lower ($P = 0.02$) in IMP (93%) vs. CON (96%) heifers, which suggests implanting heifers may have a residual or development effect on growing heifers beyond the production yr the implant was administered.

Economic Analysis

The economic analysis is presented in Table 3. Heifers were developed together by location; therefore, winter and summer feed costs and total development costs were similar between treatments ($P = 1.0$). However, the net cost of 1 pregnant heifer tended ($P = 0.13$) to be greater in CON heifers due to increased gains in IMP heifers. Cull value did not differ ($P = 0.66$) despite a $21 numerical advantage for IMP heifers.

Stocker enterprises commonly market cattle in late summer when pasture availability or forage quality may be declining. A disadvantage in the design of the present study is quantifying treatment differences in the expense and resource allocation associated with retaining heifers for an extended period beyond normal stocker marketing windows to accommodate pregnancy diagnosis. It is likely that heifers continued to gain during the extended period prior to pregnancy detection; however, the increased gain due to implant had presumably diminished due to implant potency and declining forage quality.

Conclusion

In recent years, the beef industry has seen a decline in cattle numbers and high demand for replacement females. Some beef stocker enterprises have utilized their resources to market pregnant replacement females and many cow-calf producers have marketed excess pregnant females in response to market demand. It is important to note the implant used in this study is not approved for breeding females, so when pregnant heifer value exceeds feeder heifer value, it is unlikely the additional BW gain in cull females will compensate for the decreased pregnancy rate. However, when pregnant heifer value is comparable to feeder heifer value, the additional BW gain from the implant increases the value and efficiency of stocker heifers.

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