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Growth and reproductive performance of yearling beef heifers implanted with Revalor G in the Nebraska Sandhills

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ABSTRACT

Crossbred beef heifers (n = 3,242), approximately 12 mo of age, were managed at 3 locations in the Nebraska Sandhills. Heifers were randomly assigned (May 1) to be implanted with 40 mg of trenbolone acetate plus 8 mg of estradiol (IMP; Revalor G, Merck Animal Health, Summit, NJ) or not implanted (control; CON). Heifers (238 ± 2 kg) grazed native Sandhills range for the duration of the trial (164 ± 4 d). Eighty-two ± 2 d following trial initiation, heifers were synchronized for estrus and received AI followed with clean-up bulls as part of a 25-d breeding season. Body weight was measured at the beginning and end of the trial. Pregnancy detection occurred 45 d following bull removal. During the second breeding season heifers were supplemented with 0.45 kg of a 32% CP supplement 15 d before and 15 d after placement with bulls for a 56-d breeding season. Implanted heifers gained more and were heavier ($P < 0.05$; 0.68 vs. 0.64 ± 0.01 kg/d and 347 vs. 340 ± 3 kg, IMP vs. CON, respectively) at the end of the trial. However, pregnancy rate was greater ($P < 0.01$) for CON versus IMP (64 vs. 46 ± 3%, respectively). Implanted heifers also had a reduced pregnancy rate in their second breeding season ($P = 0.02$; 93 vs. 96 ± 2%, IMP vs. CON, respectively). Implanting beef heifers with trenbolone acetate plus estradiol at approximately 12 mo of age increased ADG and summer BW gain; however, it decreased initial and subsequent pregnancy rate compared with heifers not implanted.

Key words: beef heifer, fertility, growth implant

INTRODUCTION

Administering growth implants in stocker systems results in increased growth, improved efficiency, and increased profitability (Barham et al., 2003). Initially, growth implants were used in the finishing phase of production, but over the past several decades, growth implants have been incorporated at earlier stages of growth and development. Anabolic implants increase stocker cattle BW gains by 8 to 18% or 7 to 18 kg during the grazing season (Kuhl, 1997; Selk, 1997). Kuhl (1997) reported data from 3 studies (n = 494) in which stocker heifers receiving a trenbolone acetate plus estradiol (**TBA + E2)** implant gained 12 kg more than nonimplanted controls, which was 4.6% greater than responses to zeranol (**ZER**; 36 mg of zeranol) during a 116-d grazing period. Growth implants have not been widely used in heifer calves because of subsequent reproductive concerns; however, 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 before weaning (Selk, 1997). Reproductive performance has been variable when implanting older heifers, with several studies showing decreased reproductive performance of beef heifers implanted once with ZER at weaning (Nelson et al., 1972; Pruitt et al., 1980; Prichard et al., 1989). Traditional heifer development programs focus on maximizing reproductive rates. However, if excess beef females are retained after weaning, a management strategy may be to implant heifers and accept a decreased conception rate, and increase stocker gains, provided an adequate number of replacements are achieved. Increased growth responses to implants are consistent, but reproductive performance in beef heifers has been variable. Therefore, objectives were to evaluate effects of a single stocker implant (TBA + E2) on growth and reproductive performance of yearling beef heifers in the Nebraska Sandhills.

MATERIALS AND METHODS

In 2011, 12-mo-old crossbred beef heifers grazing native Sandhills range at 3 locations were randomly assigned to be implanted (**IMP**) with 40 mg of trenbolone acetate plus 8 mg of estradiol (Revalor G, Merck Animal Health, Summit, NJ) or not implanted (control, **CON**). Heifers were implanted at the beginning of the grazing period (May 1). Initial heifer BW was similar ($P > 0.10$) between treatments (238 ± 2 kg). 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

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Products, Westlake, TX). At each location, heifers grazed common upland pastures for 164 ± 4 d.

A 25-d breeding season began 82 ± 2 d following trial initiation. Heifers at location 1 (Ashby, NE; n = 942) were synchronized with 2 prostaglandin $F_{2\alpha}$ injections administered 17 d apart (5 mL, Lutalyse, Zoetis) 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 a 25-d breeding season. At location 2 (Ashby, NE; n = 1,184) and 3 (Lakeside, NE; n = 1,116), mature bulls were placed with heifers at a 1:82 bull-to-heifer ratio 6 d before heifers received a single prostaglandin $F_{2\alpha}$ injection followed by 6 d of estrus detection and AI. Estrus detection aids were used at all 3 locations (Estrotect, Rockway Inc., Spring Valley, WI) at prostaglandin $F_{2\alpha}$ 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 received AI 12 h later. Following the AI period, mature bulls were then placed with heifers at ratios of 1:49 and 1:35 at locations 2 and 3, 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. Nonpregnant heifers were marketed as stocker cattle. During the second production year, 1,667 heifers retained as replacements (706 IMP and 961 CON) were managed in 3 groups and grazed native upland range throughout the year without further treatment. Cows were offered 0.45 kg/d of a 32% CP supplement range cube for 30 d (15 d before breeding until 15 d following bull turnout, July 25). Pregnancy diagnosis was performed via transrectal palpation approximately 45 d following bull removal.

Economic Evaluation

Heifer development economic analysis was performed in a similar way as was described by Summers et al. (2014). 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, as previously established (Larson et al., 2011). Winter range with supplement was valued at $0.75/d. Summer grazing costs, $0.55/d for upland grass, were based on Johnson et al. (2010). Additional development costs, including feed delivery costs, breeding costs, and health and veterinarian costs, were charged at $0.36/d. Average heifer purchase and cull prices were based on USDA Agricultural Marketing Service prices reported in Nebraska for each date (USDA-AMS, 2008). Net cost of 1 pregnant heifer was calculated using the formula developed by Feuz (1992). 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 one pregnant heifer. This value was divided by final pregnancy rate to determine the total net cost of 1 pregnant heifer.

Statistical Analysis

Data were analyzed using the GLIMMIX procedure of SAS (SAS Institute Inc., Cary, NC). Individual heifer was the experimental unit, and synchronization protocol was included as a random variable in the model. Location was the experimental unit for economic analysis, and in Table 2 data are presented by location. The model included implant treatment, location, and implant treatment × location as fixed effects. Least squares means and SE for ADG, BW, and pregnancy rate were obtained using the Tukey function of SAS.

RESULTS AND DISCUSSION

Heifer growth and reproductive performance are presented in Table 1 and presented by location in Table 2. Implanted heifers had greater ADG and ending BW ($P < 0.05$; 0.68 vs. 0.64 ± 0.01 kg/d and 347 vs. 340 ± 3 kg for IMP and CON, respectively). Summer gains were greater ($P = 0.03$) for IMP (110 ± 3 kg) versus CON (104 ± 3 kg). Kuhl (1997) reported response to growth implants to be 7 to 18 kg during the summer grazing period for stocker cattle. Implanted heifers gained an average of 6 kg more than CON heifers, which is slightly less than reported by Kuhl (1997). 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 (Lamb, 1996). Therefore, heifers on a higher plane of nutrition for the entire grazing period would likely have a greater growth response to implants. Additionally, a synergistic growth response for implanting in combination with supplementation is commonly observed in stocker cattle, where nutrient deficiencies are corrected, or forage resources extended, via supplementation strategies (Kuhl, 1997). In a Missouri study, providing late-season supplementation to stocker calves improved ADG in re-implanted yearlings (Sewell, 1983).

In the present study, pregnancy rate was greater ($P < 0.01$) for CON versus IMP heifers (64 vs. 46 ± 3%). This is consistent with results from Trial 1 reported by Staigmiller et al. (1983), which demonstrated a 16 percentage point reduction in pregnancy rate in implanted heifers. However, data from the present study contrast those from Staigmiller et al. (1983) in Trial 2, where similar pregnancy rates were observed regardless of implant treatment. In Trial 2, heifers were fed to reach greater prebreeding BW (293 vs. 341 kg in Trial 1 vs. Trial 2, respectively), which may explain differences in pregnancy rates. In the present study, heifers were developed to a similar prebreeding BW (294 vs. 290 kg in IMP and CON, respectively) as in Trial 1. Additionally, age at implant may also explain differences observed between previous research and the present study. Staigmiller et al. (1983) implanted heifers at 8 and 11 mo of age; in the present study, heifers were implanted at 12 mo of age. Additionally, Deutscher et al. (1986) reported